

Country	Unit	Rate	Country	Unit	Rate
Austria	Sch 10	136.50	Portugal	Esc 100	200.00
Belgium	Fr. 10	36.50	S. Africa	Rand 100	17.50
Canada	Can. \$ 100	1.05	Spain	Ptas 100	165.00
Denmark	Dan. Kr. 100	136.50	Switzerland	Fr. 100	1.36
France	Fr. 100	1.00	U.S.A.	Dollars 100	1.00
Germany	DM 100	3.36			
Greece	Dr 100	340.00			
Italy	Lira 100	2036.00			
Japan	Yen 100	163.00			
Netherlands	Gld 100	203.60			
Norway	Nkr 100	136.50			
Sweden	Kr 100	136.50			
UK	£ 100	1.00			

NEWS SUMMARY

GENERAL

N-cargo salvage plans begin

Two salvage companies, one Dutch, one Belgian, were given the task of recovering 30 containers of transuranic hexafluoride, a radioactive gas, which were on board a French-owned cargo vessel which sank off the Belgian coast on Saturday.

Owners of the Mont-Louis, which was carrying 225 tonnes of radioactive material to the Soviet Union, said that two to three weeks would be needed for the salvage work. Earlier the French Government had urged a rapid salvage.

The two companies given the task are L'Union de Remorquage et de Sauvetage de Belgique and Smit Kat International of Holland.

Bangladesh strike

A nationwide strike against martial law in Bangladesh virtually paralysed most cities. Police said 50 people were injured in clashes between opposition and government supporters in Dhaka.

Gandhi's campaign

Mrs Gandhi's ruling Congress (I) Party in India has launched a campaign to extricate itself from a constitutional row over the dismissal of former film star Mr N. T. Rama Rao from the job of Chief Minister of Andhra Pradesh, Page 3

S. Africa protest

Thousands of Indian students boycotted classes in South Africa in protest at elections today for a new parliament. Police reported violence in townships near Pretoria, Namibia talks, Page 3

Tanker attacked

The Panamanian-registered tanker Cleo 1 was set on fire in a rocket attack in the Gulf. The raid appeared to be Iranian retaliation for an Iraqi attack on another tanker last Friday, Page 2

Sharon wants Jordan

Former Israeli Defence Minister Ariel Sharon said Jordan rightfully belonged to Israel and would now be settled by Jews, an Israeli newspaper reported. Coalition bid, Page 2

Trial to resume

Hamburg court rejected a defence contention that the six judges in the "Hitler Diaries" case were not qualified to give journalist Gerd Heidemann a fair trial because of previous publicity. The trial resumes today.

Shuttle tries again

Discovery, the third U.S. space shuttle, is due to make its maiden voyage tomorrow. Two attempts in June were stopped by mechanical failure.

Oil concessions

Egypt signed four oil exploration concessions with U.S. and British companies worth a total of \$201.7m. The agreements cover offshore areas in the Gulf of Suez, the Mediterranean and the desert east of Cairo, Page 4

Syrian disquiet

Libya's agreement on a "state of union" with Morocco appears to have badly strained relations with its firmest Arab ally, Syria, Page 3

Prague celebration

Soviet Defence Minister Dmitry Ustinov flew to Prague to represent the Kremlin at celebrations marking the 40th anniversary of an anti-Nazi rebellion in Slovakia.

'Arkaology' find

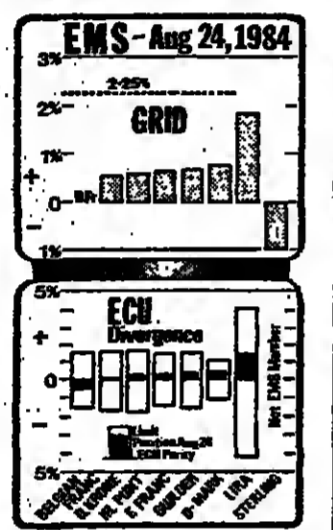
Rocks and decayed wood from Mount Ararat that biblical archaeologists hope are remnants of Noah's Ark have been brought to the U.S. for laboratory analysis, an expedition spokesman said.

BUSINESS

Arco to write down \$785m

ATLANTIC RICHFIELD oil group of the U.S. said it would suffer a write-down of \$785m in the third quarter from its metals and minerals operations. It also plans to repurchase 25m shares, about 10 per cent of its issued equity.

CURRENCIES continued to trade actively within the European Monetary System last week. Activity slowed as the dollar lost direction and there appeared to be little incentive to take out new positions before the dollar gains fresh impetus. French interest rates touched a 3 1/2 year low, but the Bank of France



left its money market intervention rate unchanged. Belgian rates were also a little easier and although the Belgian franc was a little weaker overall, it was placed comfortably within its divergence limit.

The chart shows the two constraints on European Monetary System exchange rates. The upper grid, based on the weakest currency in the system, defines the cross rates from which no currency (except the lira) may move more than 2 1/2 per cent. The lower chart gives each currency's divergence from its "central rate" against the European Currency Unit (ECU), itself a basket of European currencies.

WALL STREET: The Dow Jones industrial average closed down 6.81 at 1,237.52. Section II

TOKYO: Nikkei-Dow market closed 5.06 higher at 10,568.72 in light trading. Section II

STERLING was unchanged in New York at \$1.307.

DOLLAR advanced in New York to DM 2.8685 (DM 2.86725) Ffr 8.8680 (Ffr 8.8625), SwFr 2.407 (SwFr 2.381) and Y241.96 (Y240.75).

GOLD lost \$1.05 in Zurich to \$348.50. In New York the Comex August settlement was \$348.60.

FRENCH borrowing abroad this year is running at a considerably faster pace than the Government had anticipated, Page 2

WEST GERMANY'S chemical industry expects to boost production by 5 per cent in real terms this year, Page 2

NEGOTIATIONS between the Philippines Government and the IMF on an SDR 615m (\$621m) standby credit have reached a critical phase as pessimism deepens over the country's long-term economic prospects, Page 3

THAILAND launched an international advertising campaign to encourage new bids of up to \$500m, to double capacity at the Thai Oil Refining Company near Bangkok, Page 2

PROPOSALS for a multi-year rescheduling of Mexico's public sector debt will be sent to its creditor banks early next month, Mr William R. Rhodes, Citibank vice-chairman, said after "substantial progress" was made at negotiations over the weekend, Page 12

Production difficulties in London may have resulted in typographical errors in unit trusts, some advertisements and elsewhere in today's edition.

Peugeot chiefs in boardroom battle to control group

BY PAUL BETTS IN PARIS

AN INTERNAL battle over the running of Peugeot, France's largest private enterprise, has erupted at a crucial moment for the troubled car company, which is pressing ahead with large-scale redundancies in its efforts to cut losses.

M. Jean-Paul Parayre, group chairman, has called a board meeting next week to resolve an internal dispute with M. Jacques Calvet, former chairman of Banque Nationale de Paris (BNP) who is now in charge of the day-to-day running of Peugeot's entire car operations, embracing the Peugeot, Talbot and Citroën marques.

M. Parayre was angered by French newspaper reports yesterday suggesting that he was about to resign and make way for the appointment of M. Calvet to head the group.

M. Parayre, who became chairman of the Peugeot group in 1977, was appointed for a new four-year term only last April. He has, however, found it difficult to work with M. Calvet, who was brought into the group in 1982 and has increasingly overshadowed M. Parayre.

M. Parayre has therefore decided to force a boardroom showdown, suggesting he would step down if the present senior management structure was kept.

The boardroom battle has been simmering for several months as the division of power increasingly strained relations between two men of different temperament and style.

M. Parayre, 47, has been one of the main architects of Peugeot's expansion as a volume car producer through the acquisition first of Citroën and then of Chrysler's European operations, subsequently renamed Talbot.

He has inevitably carried the blame for the difficulties of digesting Chrysler's European operations and Peugeot's subsequent serious financial problems. The group lost Ffr 2,580m (\$394m) last year and Ffr 3,780m this year before its total debts amount to about Ffr 45bn.

However, M. Parayre also launched the company's recovery programme in 1979, involving more than 50,000 layoffs between 1979 and 1982 and the rationalisation and streamlining of the group's industrial operations. He is also credited with the success of the Peugeot 205 supermini model and the Citroën BX.

However, since he was brought in three years ago to help Peugeot to put itself into order financially, M. Calvet has rapidly risen to a position where he virtually shares the running of the company with M. Parayre.

The former banker — a forceful personality renowned for his strong temper — has been at the centre of the group's latest effort to cut further its French workforce. M. Calvet, 52, has led negotiations with the Government and the trade unions for the large job reductions at Talbot and Citroën.

Although the Talbot layoffs led to a serious labour conflict, M. Calvet successfully negotiated with the Government nearly 2,000 redundancies at Citroën. However, those redundancies are expected to become a test case both for the pro-communist CGT union and the socialist Government. The CGT has called workers to reject these redundancy plans when the Citroën factories reopen this week after the summer closure.

The Government, the car company and the unions all want to avoid a repeat of the Talbot dispute, which led to violent clashes at the Talbot plant of Poissy near Paris at the beginning of this year.

Peugeot, which managed to reduce considerably its losses in the first half of this year compared with the same period last year, has argued forcefully that the redundancies were crucial for the financial recovery of its Citroën branch and the group as a whole.

Employees believe that at today's meetings there is an even chance that dockers at Southampton and Bristol — important ports in the national dock labour scheme — will reject a strike. Another scheme port, Ipswich, is expected to continue working.

Mr Sem McVeigh, Northern Ireland union dock official, said his members felt that the strike was "not so much about protecting dockers' jobs as about supporting the miners."

Another factor was that it was only six weeks since the last strike (which lasted 11 days) over the use of non-regulated dock labour by British Steel.

Container traffic will flow freely to the European continent if — as seems likely — most of the roll-on, roll-off ferry ports such as Dover, Folkestone, Portsmouth and Felixstowe stay open. Dover will not hold a mass meeting until Friday.

The TGWU plans to picket working ports, possibly with the support of miners. The pickets may be thinly spread if more docks reject the strike.

In the miners' dispute, now in its 23rd week, efforts are under way to set up a meeting between leaders of the Trades Union Congress (TUC) and the NUM which would seek to avert a damaging split over support for the miners at the TUC's annual congress next week.

Thousands of demonstrators are expected at the congress, in Brighton on the south coast of England. A meeting before the congress between the TUC and NUM is still possible, although the miners' union has not agreed to a request from the TUC to bring forward a meeting of the union's national executive planned for Thursday.

Mr Peter Heathfield, general secretary of the NUM, will speak to Mr Len Murray, TUC general secretary, this afternoon after consulting members of the miners' executive.

There is no hint as to whether the NUM is prepared to compromise on its insistence on increased financial and physical support being given to it by other unions without strings.

Mr Arthur Scargill, the miners' president, said at the weekend that it would be a betrayal if the TUC gave less than financial support.

Industry braces itself, Page 5

World economic woes, Page 10; Mexican debt talks, Page 12

Mr Jacques de Larosiere, managing director of the International Monetary Fund, issued a warning yesterday that the unprecedented explosion of public debt could lead to worldwide economic and financial disorder.

The cumulative growth of public debt since the 1970s, if not checked, "could have far-reaching consequences on the very fabric of our society," he told the congress of the International Institute of Public Finance in Innsbruck. Governments could no longer avoid "difficult choices on action to cope with the problem," he said.

Mr de Larosiere called for a "consensus" to halt the exploding momentum of public debt of the Western industrial countries. In the seven largest industrial countries, he said, the ratio of public debt to gross national product (GNP) had risen from an unweighted average of 22 per cent in 1974 to 41 per cent last year.

"In my judgment, that growth is unsustainable over the long run," Mr de Larosiere said. "Thus, either it is stopped by co-ordinated and rational policies or it will be stopped, as in the past, by a new burst of inflation with all the social, political and economic disarray that accompanies it. What is at stake here is monetary stability, and the soundness of institutions."

Mr de Larosiere said that to the extent that interest payments were growing as a proportion of GNP, other spending must be reduced or taxes increased by the same amount to keep the deficits growing. The larger the increase in interest payments, the larger must be the spending cuts or tax increases.

Because it could soon become "politically difficult" for governments to take such steps, it was imperative that countries did not wait to take the required corrective policy decision. "The longer they wait, the more serious the disease becomes and, while the medicine needed at this time may appear unpalatable, it will surely be much more so as time passes," he said.

No expenditure should be seen as "untouchable" including social and welfare payments, Mr de Larosiere said.

On the revenue side, increases had to come "through the utilisation of realistic prices, for public services as well as through reforms of tax systems." No group must be "automatically insulated."

Mr Hans Werthen, chairman of Electrolux, said yesterday that he hoped a compromise would be reached with Zanussi's foreign bank creditors.

He spent yesterday at the Pordenone headquarters of Zanussi in

North-eastern Italy, and after meeting regional politicians said that a meeting would be held tomorrow in Rome of all the Italian parties concerned.

A key element in the rescue is that Zanussi's foreign bank creditors should accept a substantial write-down on the \$50m to \$65m of their outstanding loans. The banks recently turned down Zanussi's original proposal that they should take a 70 per cent lump sum in payment for the outstanding debt.

Continued on Page 12

IMF head warns of disorder amid debt growth

By Reginald Dale, U.S. Editor, in Washington

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Continued on Page 12

Unitary tax move resisted in California

BY LOUISE KEHOE IN SAN FRANCISCO

NINETY U.S. multinationals with operations in California have decided to change their stance on the reform of unitary taxation in the state. They say that Bills coming before the state Assembly would unfairly benefit their foreign competitors.

The companies include IBM, Hewlett-Packard, National Semiconductor, Intel and several other Silicon Valley electronics manufacturers. They have long campaigned against the unitary tax laws under which companies are assessed for tax on their worldwide income.

Under the pending legislation due this week, all multinational corporations will have the option to continue to be assessed on their worldwide income or to change to assessment of their U.S. income. Which choice a company makes will depend on how it is organised, where it does business and where its profit centres are.

The U.S.-based multinationals that now oppose the tax reforms have calculated that the unitary tax method will remain the best option for them, but that their foreign competitors will be able to cut their tax liability by switching to the second option.

The chief complaint of the U.S.-based multinationals is that those of the foreign companies, would continue to be taxed in California.

Another problem for many U.S. electronics and computer companies is that they have extensive oper-

ations overseas in countries that have been defined as tax havens — in particular Singapore and Malaysia. Income derived from these operations would be treated as U.S. income for the purpose of tax assessment under the proposed legislation.

"This Bill seems grossly unfair," Dr Gordon Moore, chairman of Intel, said. He estimates that the proposed revisions would give foreign multinationals operating in California a \$250m tax break. "That would put us at a severe competitive disadvantage," he said.

IBM, which has fought vociferously against unitary taxation in Florida and threatened to scrap plans for expansion in the state unless unitary tax laws were repealed, has also switched its position in California.

Mr John Mercer, tax specialist at National Semiconductor, says that the companies will mount a strong lobbying effort against the reform. "Killing this Bill is our number one priority," he said.

The companies have had little luck in persuading the legislators to amend the laws. "If they can bring me documentary evidence of how their competitive position will be affected, I would be glad to put it before the Governor, but so far they have not," Ms Nancy Ordway, chief deputy director of the California department of finance in Sacramento, said.

Continued on Page 12

Electrolux to press for Zanussi accord

BY KEVIN DONE, NORDIC CORRESPONDENT, IN STOCKHOLM

ELECTROLUX, the Swedish electrical group, is to meet the foreign bank creditors of Zanussi in London on Friday to try to break the deadlock in its bid to take over the financially crippled Italian home appliances manufacturer.

The refusal of Zanussi's 24 foreign bank creditors to go along with the terms of the rescue package agreed with other major parties after nine months of negotiations is still threatening to jeopardise the deal.

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Aerospace Survey Section III

20th Edition - indicates steady growth

JLW INDEX

JLW PROPERTY INDEX

When deciding where to invest it is vital to have all the reliable, accurate information you can get. The quarterly JLW Property Index provides unbiased data on capital and rental growths as well as overall performance of a broadly based property portfolio. Available now on request from JLW Research Library, Mount Street.

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OVERSEAS NEWS

French borrowing exceeds forecasts

By David Housego in Paris
FRENCH borrowing abroad this year is running at a considerably faster rate than the government had originally anticipated.

On unofficial estimates French institutions have already raised this year close to \$8bn (£6.7bn) or roughly the equivalent to the Finance Ministry's target for the whole of this year.

The accelerated borrowing reflects the slower-than-expected improvement in France's trade deficit as well as a move by French institutions to take advantage of favourable market conditions to refinance existing debt on cheaper terms.

Foreign bankers said yesterday they expected that the higher level of borrowing would continue as French institutions sought to refinance existing high cost debt.

The slightly lower rates now available to French borrowers are the result of easier conditions in the floating rate market and of confidence abroad that the government is determined to stabilise France's foreign debt.

Figures released recently by the Finance Ministry showed that France's outstanding foreign debt (fresh borrowings less repayments) had risen by only \$1.9bn in the first half of the year to \$5.6bn.

According to the Organisation of Economic Co-operation and Development, France raised \$1.8bn on the international markets in the first six months of the year.

In the last two months, an estimated additional \$3bn of new loans has been contracted.

In the initial estimates by the Finance Ministry, France was expected to borrow some FFr 67bn in "authorised" fresh loans this year compared with FFr 111bn last year.

These estimates were based on the trade deficit being reduced to FFr 25bn by the end of the year and on the current account deficit being eliminated.

The trade deficit for the first seven months, however, has risen to FFr 23bn, while the current account deficit for the first six months stood at FFr 10bn.

Boost for Bonn chemical industry

By Jonathan Carr in Bonn

THE West German chemical industry expects to boost production by 5 per cent in real terms this year after a first half performance which was still strong despite the strikes in the metalworking and printing sectors.

The Chemical Industry Association (VCI) said production rose in January-June by 7 per cent against the same period of last year, and would have been 1 per cent higher but for the strikes.

The stoppages affected, among other things, demand for paints and plastics products for the vehicle industry and for offset plates for printers.

Chemicals sales revenue in the first half surged by 14.4 per cent to DM 71.4bn (£19bn), due largely to an increase of 20.5 per cent to DM 31.4bn in foreign turnover. Despite the impact of the strikes, domestic sales were up by 10 per cent to DM 40bn.

Exports rose by 21.5 per cent to DM 38.1bn, thus carrying the export share of overall sales to more than 50 per cent for the first time.

The strength of the dollar was one factor helping the West German companies boost their foreign sales, but exports to EEC states—especially Britain—were strong too.

The industry's earnings improved in the first half largely because of a better use of capacity and despite higher labour, raw materials and energy costs, the association said.

Last week the "big three" chemical companies—Hoechst, Bayer and BASF—announced first-half group pre-tax profits roughly double the level of the same period last year.

The industry said it expected to invest DM 7bn this year with more of the sum going on enlargement of capacity than on rationalisation and replacement of plant and machinery.

Another DM 7bn would be spent on research and development. A total of 547,000 people were employed in the industry in the first half—0.8 per cent fewer than in the same period of last year. However, the chemical companies have taken about 2,500 extra workers since January.

Formaldehyde curbs planned

By Our Bonn Staff

THE WEST GERMAN Government is preparing tougher regulations to curb the use of formaldehyde, the chemical which has caused a major public dispute here.

Dr Helner Geissler, the Health Minister, said the rules would be introduced irrespective of the result of an expert report he expected in October on whether formaldehyde could cause cancer.

Dr Geissler noted yesterday that the chemical, widely used as a preservative and disinfectant, was already governed by many rules and recommendations because of its toxic properties.

By the end of the year the Government would put before the Bundestag (the upper house of parliament) tighter regulations to help ensure that excessive indoor concentrations of formaldehyde in the air could not build up.

Later, tougher measures governing use of the chemicals in hospitals and at work places were also foreseen.

Dr Geissler rejected charges made last week in some newspapers and by the Greens, the environmentalist party, that he had covered up evidence proving formaldehyde could cause cancer.

The ministers said several groups of federal experts had presented preliminary reports which came to different conclusions about formaldehyde as a possible cancer agent. He had therefore instructed the experts to produce a joint report by October.

Dr Geissler said he would act quickly on the basis of the report and stressed that the Government put health protection before economic interests.

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W. Germany rejects charges by Pravda

The West German Government yesterday dismissed as "fantasy" charges by the Soviet newspaper Pravda that Bonn was carrying out an economic annexation of Austria, Reuter reports.

Yesterday's edition of the Communist party daily claimed West German businesses were swamping Austria with exports and infiltrating its entire economy by taking over hundreds of local companies.

This amounted to a "quiet economic Anschluss" (annexation), it said, in reference to Hitler's occupation of Austria in 1938.

U.S. productivity up Productivity by non-farm private U.S. business jumped at an annual rate of 4.7 per cent during the second quarter, the Labor Department said yesterday, AP reports from Washington.

This was the eighth straight quarterly increase marking the longest string of gains in more than a decade, the department added.

Dutch budget The Dutch 1985 budget proposes savings of more than Ft 10bn (£2.2bn) but also provides relief for industry worth Ft 1.5bn (£357m) officials said yesterday, Reuter reports from Amsterdam.

The budget, finalised by the Cabinet on Friday, is not due to be announced until September 18.

Mr Rijkman Groenendaal, the Prime Minister, said, however, that a planned cut in corporation tax from 43 per cent to 41.5 per cent on the budget.

Afghan negotiations UN-sponsored talks aimed ultimately at the withdrawal of Soviet troops from Afghanistan moved into a new phase yesterday when the UN negotiator, Sir Diego Cordovez, began talks with both the Afghan and Pakistani Foreign Ministers, Reuter reports from Geneva. So far, the contents of the talks remain secret.

China jails radicals Eighteen members of an underground organisation opposed to the pragmatic policies of China's leader, Deng Xiaoping, have been jailed in the province of Henan, Henan radio said, Reuter reports from Peking.

The group were described as supporters of the disgraced "Gang of Four".

Sikhs arrested NEARLY 60 Sikhs have been arrested in Punjab State since the hijack last week of an Indian airliner by Sikh extremists, according to the Press Trust of India, Reuter reports from New Delhi.

Each generator contains about 3,000 pipes. Nearly 10 per cent are damaged—the maximum allowed by Swedish nuclear regulatory agency guidelines.

Last year the board was forced to rebuild the steam generators in the Ringhals 3 and 4 units because of other design flaws at a cost of some SKr 200m.

Similar problems have plagued Westinghouse reactors delivered in West Germany and the U.S., Vattenfall said.

Pipe corrosion in all three steam generators of Sweden's large Ringhals 2 nuclear reactor is nearing an "unacceptable level and is likely to cause authorities to close the unit and order replacement within a year, according to the state power board Vattenfall.

A decision is likely to come before the end of the year, and the cost could reach the original SKr 1bn (£92m) purchase price. This summer, Vattenfall applied a protective coating to the steam pipes in an effort to slow the damage.

The 10-year-old unit is one of three pressurised water reactors in Sweden, all of which were delivered by Westinghouse of the U.S.

Similar problems have plagued Westinghouse reactors delivered in West Germany and the U.S., Vattenfall said.

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Greek-owned tanker hit by missile off coast of Qatar

BY KATHY EVANS IN DUBAI
A GREEK-OWNED tanker, the \$5,730 dwt Cleo I, was hit by a missile fired by an unidentified aircraft, thought to be Iranian, off the coast of Qatar yesterday.

The area has been the scene of two previous strikes by Iran this month, and marks the third attack in five days by Iran in the continuing Gulf conflict.

Local shipping officials are apprehensive that the increasing frequency of the air raids could generate a reaction from Lloyd's of London concerning war-risk insurance.

The Cleo I was on her way from South America to Ras Tanoura oil terminal in Saudi Arabia for her owners, the Troodos shipping company in Piraeus, it was the second ship in a week to become the target of an attack.

Last Friday, the 53,000 dwt Amethyst, owned by the same company, was attacked by Iraq after leaving Kharij Island oil terminal on her way to Aden. The Amethyst was badly damaged by fire and was towed to Levant Island.

The Cleo I was said yesterday to have brought the fire on board under control and was making for Doha, using emergency steering. A U.S. warship was on hand to provide assistance.

Oil traders in the Gulf believe that the Iraqi strategy of hitting Iran-bound shipping is succeeding in depressing Iranian oil exports. Exports are now thought to be only 1.5m barrels a day and buyers are pressing for larger discounts.

Oil traders say, however, that Iran is insisting on selling its oil at the official price—hence the fall in sales.

Peres meets Shamir in new bid for coalition

BY DAVID LENNON IN TEL AVIV
MR SHIMON PERES, Israel's Prime Minister-designate, who was granted a 21-day extension on Sunday of his mandate to form a Government, began his second round of attempts to form a coalition by meeting Mr Yitzhak Shamir, the outgoing Prime Minister, last night.

President Chaim Herzog gave the Labour Party leader an additional three weeks, mainly because of the alliance which Mr Peres had been able to form with Mr Ezer Weizman's three-seat Yehud Party last week.

Yehud's move into the Labour camp has made it virtually impossible for Mr Shamir's Likud bloc to form a new Government, even with the support of its natural allies, in the right-wing and religious parties.

Because the outcome of last month's general election made it difficult for either of the big parties to form a narrow coalition, Labour and Likud have been negotiating for the past three weeks on setting up a broad-based Government of national unity.

The Peres-Shamir meeting is thought to have concentrated on the question of retention of the premiership and the portfolios which Labour would give Likud Cabinet members. Other issues still outstanding are the future of the Jewish settlements on the West Bank and peace overtures to Jordan.

Violence flares in Beirut

A GUN-BATTLE involving Lebanese Army soldiers in Beirut and a deepening crisis between President Amin Gemayel and Mr Walid Jumblatt, the Druze leader and Minister, have raised concern about the fate of the Government and the truce in the capital, Nora Boustany reports.

Four soldiers and one civilian were wounded in a four-hour shoot-out on Sunday in the centre of Beirut between army regulars and Muslim gunmen—the first such violation of a Syrian-sponsored ceasefire. This coincided with a sharp attack by Mr Jumblatt against the President.

The Druze leader made his remarks during a funeral ceremony for Maj-Gen Nadim Hakim, the highest-ranking Druze officer, who was killed in a helicopter crash in Northern Lebanon last Thursday.

Mr Jumblatt, reflecting the Druze community's distrust of the central army command and the Christian Maronite President, charged that Maj-Gen Hakim had been assassinated.

An investigation is under way, though an army spokesman said the crash was due to foggy weather.

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Spanish talks on labour pact resume

By David White in Madrid
SPAIN'S Socialist Government and the Socialist-led UGT trade union, are trying to restore momentum to talks on a wide-ranging two-year labour pact after a display of reticence by the other partners.

Discussions with the main union and employer organisations resumed yesterday after an interval of more than three weeks. No concrete progress was made in the early rounds of talks.

The Government, represented at yesterday's talks by Sr Joaquin Almunia, Labour Minister, is anxious to put an agreement together by the end of next month before it sends its draft 1985 budget to parliament.

Sr Marcelino Camacho, the Workers' Commission leader, has described prospects for agreement as "very difficult".

64 Portuguese companies may face bankruptcy

By Diana Smith in Lisbon
BANKRUPTCY may be the only way out for 64 Portuguese companies in such dire financial straits that their workers have not been paid for months.

The companies, led by Lisnave ship repair yards, CIFA, an artificial fibre plant in Oporto, and CIVE, glass-makers in Leiria, have been singled out in a government report on 350 companies which have piled up debts in unpaid salaries, social security contributions and unemployment fund obligations.

The 64, the report says, are potentially unviable. Propping them up with emergency funds for salary payments or repeatedly backing emergency loans to keep them afloat is no longer a solution. The report says that bankruptcy should be urgently considered.

The crippled companies also include several medium and large textile firms, small shipping companies and service companies. They have piled up Esc4.7bn (£24m) in unpaid wages and contributions.

The three worst debtors between them owe the equivalent of about £12m. Lisnave alone employs more than 6,000 people. Part private, part state-owned, the yard was once Portugal's export-earning showcase. But in recent years it has been plagued by the international shipping crisis and constant industrial unrest.

It has long been apparent that the Government of Prime Minister Mario Soares is reluctant to go on supplying crutches to industrial lame ducks and anxious to concentrate its modest resources on companies with better futures.

The problem of persistently unpaid wages has affected Portuguese families in industrial areas.

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Bankers worried by Manila-IMF debt pact delay

BY CHRIS SHERWELL IN SINGAPORE AND EMILIA TAGAZA IN MANILA

PROTRACTED negotiations between the Philippines Government and International Monetary Fund on an SDR 615m (\$475m) standby credit have reached a critical phase, as pessimism deepens over the country's long-term economic prospects.

Mr Jose Fernandez, the Philippine central bank governor, indicated yesterday that the talks, which have dragged on for almost a year, remained on course, and he voiced optimism about a deal.

But the gap remains wide, with Manila hesitating in particular over a flotation of the peso, which has already been devalued three times since June last year.

The Government is also facing severe difficulty meeting IMF targets for the reduction of the money supply, especially after a recent costly rescue of a major bank.

Agreement with the IMF is the key to a vital debt rescue package with commercial banks and official creditors, involving \$3.5bn (\$2.5bn) of a new money swap and rescheduling of a substantial portion of the country's \$25.6bn external debts.

Even with a deal, the Philippines is not expected to recover its pre-crisis economic position before 1990.

It is the only country in the region experiencing a severe contraction in gross domestic product, estimated at 6 per cent in real terms. The annual inflation rate has risen to 50 per cent.

Western bankers are worried that an IMF agreement will not be concluded before the Philip-

piners' latest three-month moratorium on principal repayments expires in mid-October, exactly one year after being invoked. They fear that some creditors will stop waiting and take further action, perhaps triggering a default.

A local official says there is only a 50-50 chance of a deal before the IMF's annual meeting in late September. Failure to meet that goal would postpone final agreement, and bankers already forecast no new money before the first quarter of 1985.

That means a major readjustment in the rescue package, which originally applied for the 18 months to the end of this year. Mr Fernandez confirmed yesterday that the talks are now focusing on the 18 months to March 1986, which means a rise in the new money required.

Some businessmen wonder whether the Philippines Government might outlast the IMF, forcing the Fund to compromise more than it would like.

Others say investor confidence has plunged so low that conventional economic solutions are no longer available. They say the IMF must not only stand firm but seek a limitation on President Ferdinand Marcos's powers to rule for decree.

This would take the IMF beyond its normal bounds, but a recent University of the Philippines analysis argues that only a change in the system of government, towards less centralised political and economic decision-making, can now overcome the country's economic crisis.

Gandhi in drive to avoid clash over Rama Rao sacking

BY JOHN ELLIOTT IN HYDERABAD

MRS INDIRA Gandhi's ruling Congress-I Party in India has launched a campaign to extricate itself from a serious constitutional row over the dismissal of the former film star, Mr N. T. Rama Rao, from the job of Chief Minister of the State of Andhra Pradesh.

Two of the state's Congress I leaders—the Governor and the local Parliamentary chairman—have resigned and Mrs Gandhi has not yet confirmed she will give support to Mr N. Bhaskara Rao, the new Chief Minister.

Last night, Mr Bhaskara Rao claimed he had a majority ready for when the state legislature meets. He also accused Mr Rama Rao's party of "taking as hostage" 156 members of the legislature to the neighbouring state of Karnataka so that they could not join him.

The crisis could prove a serious political setback for Mrs Gandhi as she approaches India's coming general election. She said at the weekend the

election would take place "on schedule"—which means by mid-January.

It is now clear that the party's national leadership tends to stress that the leaders in Andhra, and not Mrs Gandhi or her national advisers, were responsible two weeks ago for refusing to let Mr Rama Rao test his majority in the state legislature.

Mr Ram Lal, the Andhra governor, who refused Mr Rama Rao's request, resigned last

Friday. He was replaced over the weekend by Mr S. D. Sharma, another senior Congress-I figure, who has held top posts in the party and in national and state government.

Mr A. Madan Mohan, leader of the Congress-I group in the state legislature, resigned on Sunday. He said he "took full responsibility" for pledging his party's support for Mr Bhaskara Rao without consulting the party's national leaders.

"The Congress-I leadership of Mrs Gandhi was in no way responsible," he declared.

It is believed that if Mr Bhaskara Rao fails to produce sufficient support from within his own party, Mrs Gandhi will say that the resulting crisis warrants her intervening directly by declaring President's Rule, which in effect means direct rule by her national government from New Delhi.

Mr Bhaskara Rao's "hostage" accusation was a reference to 156 members of the legislature who flew with Mr Rama Rao to New Delhi last week to appeal to the President. They then flew to Bangalore, capital of Karnataka.

A spokesman claimed they would not return to Andhra's capital of Hyderabad until just before the assembly meets on a date to be fixed.

Ethnic violence causes sharp fall in Sri Lanka tourist revenues

BY JOHN ELLIOTT, RECENTLY IN COLOMBO

SRI LANKA'S major tourist industry has suffered heavily during the first six months of this year as a result of the ethnic violence which broke out last summer and is now building up again.

The number of tourists arriving in the country dropped by 30 per cent compared with the first half of last year and revenue dropped between about 15 and 20 per cent for the period January to June.

Foreign industrial investment has also been hit. Senior ministers are worried that a bid now being launched to rebuild confidence may be undermined by recent violence by both terrorists and troops.

Two U.S. electronics companies, Motorola and Harris Corporation, have not gone ahead with investment plans drawn up last year.

But the immediate economic impact of the troubles has been partly offset by increases of over 50 per cent in the price of Sri Lankan tea exports, which have more than made up for the tourist losses in export earnings.

The Government expects to have a balance of payments surplus of almost \$300m (\$154m) in the current year. After a series of deficits between 1978 and 1982 and a small surplus of about \$500,000 last year it will be the biggest surplus for 10 years.

This has saved Sri Lanka from having to reopen talks with the International Monetary Fund for a standby loan. Four months ago it resisted

IMF proposals for devaluing the rupee and making large budget cuts.

But a devaluation is now being considered. The IMF would like the present rate of about Sri Lankan Rupees 25.40 to the dollar changed to at least 27.

The Central Bank of Ceylon (it keeps the country's old title) is believed to be considering moving to about 26.50 rupees to the dollar.

Talks have not been broken off completely with the IMF. "In the long term we need an IMF agreement—it would make us more credit worthy with our aid donors," says Mr Ronnie de Mel, the island's Finance Minister.

Mr de Mel says the economy is "looking brighter than for several years" because of the balance of payments surplus, although he accepts that this is largely due to the international price of tea.

Inflation has risen at a rate of 18 per cent over the past 12 months, according to government figures, although some observers say the true figure is nearer 25 per cent.

This compares with an official figure of 10 per cent in 1982 and 22 per cent last year. Government estimates optimistically suggest it will fall by the end of this year to something between 10 and 14 per cent.

Mr de Mel also acknowledges that the country's current debt service ratio at "a little above 20 per cent" is alarmingly high. He hopes that rising

exports will bring this down to 18 per cent by the end of the year.

Public spending is still higher than the IMF and the World Bank would like, although cuts have been announced. A budgetary deficit of 23 per cent of GDP in 1980 and 13 per cent last year is expected by Mr de Mel to fall to 9 to 10 per cent this year.

The World Bank is concerned about Sri Lanka's long-term debt burden and its large scale investment programme.

The latest World Bank report says the quality and composition of public sector spending has received inadequate attention. Mr de Mel acknowledges the

need to "restrict some of the low yielding, slow gestation projects and go for quickly productive and export oriented projects."

Mr Junius-Jawardene, Sri Lanka's President is considering offering an amnesty to Tamil terrorists involved in violence in the north of the island. He might also arrange for them to have talks with government representatives.

This is not yet an official government policy. Mr Jawardene made the offer at the weekend in an interview with the Indian Express newspaper, the first time he has aired such an idea in public. It illustrates a new urgency in Colombo to solve the problems.

Assad 'in bid to abort Libya-Morocco union'

BY RICHARD JOHNS IN TRIPOLI

COL MUHAMMAD GADDAFI'S agreement with King Hassan on a "state of union" between Libya and Morocco appears to have badly alarmed relations with his one reasonably firm ally in the Arab world—the Syrian régime of President Hafez al-Assad.

That is the interpretation placed by diplomatic observers here on President Assad's arrival last Thursday in Benghazi, the main city of eastern Libya. He was reported to have returned at the weekend after last week's President Chadli Bendjedid of Algeria.

Diplomats believe President Assad may be making a last-ditch effort to abort the union which is to be the subject of a referendum in Morocco on August 31 and may be formally declared by Col. Gaddafi at the celebrations for the anniversary of the Libyan Revolution here on September 1.

President Assad, it can be assumed, was angered that Col Gaddafi did not inform or consult him before his meeting with King Hassan on August 13 at Oujda, the Moroccan/Algerian border town.

Diplomats point out that

Libya's last agreement on union was with Syria four years ago, and it is not completely dead, still finding expression in the Arab People's Union, a forum in which representatives of the two countries gather periodically.

Meanwhile, as the Libyan state media continues to extol the treaty with Morocco, little attention has been paid to President Assad's visit here.

Algeria dismissed the Libyan-Moroccan agreement as an irrelevant diversion from the unresolved problems of the nine-year-old war in the Western Sahara.

In line with its rapprochement earlier this year with Morocco, Libya withdrew support from the Algerian-backed Polisario Front, which is fighting the Moroccan army.

Col Gaddafi evidently wanted both King Hassan and President Assad to come to the September 1 celebrations.

Clearly, however, neither would be willing to attend in the presence of the other and any increase in Col Gaddafi's influence over the Maghreb could be at the expense of close ties with Damascus.

Bahrain suffered \$143m trade deficit last year

BY MARY FRINGS IN BAHRAIN

BAHRAIN last year registered its first trade deficit since 1979, according to a report just published by the Bahrain Monetary Agency (BMA).

Although the overall balance of payments remained positive, thanks to a surplus on invisibles of \$205m (\$205m), there was a fall in Bahrain's trade account, and in particular a reduction in the oil trade surplus, from \$1,288m to \$1,154m.

A deficit in visible trade of \$143m, compared with a surplus in 1982 of \$175m, was attributed partly to a reduction in the oil trade surplus, from \$1,288m to \$1,154m.

The balance in the non-oil trade account is traditionally unfavourable, but this was accentuated last year by a fall-off in Bahrain's trans-shipment trade with other Gulf states, which despite a 40 per cent increase in aluminium exports led to a 5 per cent reduction

in the value of total non-oil exports, from \$644m to \$612m.

At the same time the non-oil import bill increased 8 per cent from \$1,764m to \$1,910m, mainly as a result of the construction of big projects such as the Saudi-Bahrain causeway, petrochemical and iron reworking plants.

The surplus on services and net capital transfers was \$268m compared with a deficit of \$2.9m the previous year, and the overall balance of payments surplus stood at \$125m, 23 per cent down on 1982.

Other highlights from the BMA report:

- The Government budget recorded a deficit of \$133m last year, against a surplus in 1982 of \$221m. Actual revenue fell 12 per cent, and total expenditure increased 13 per cent.
- Domestic inflation fell from 6 per cent in 1982 to 3.5 per cent last year.

Namibia talks to resume

BY JIM JONES IN JOHANNESBURG

TALKS ON the future of Namibia (South-West Africa) between South Africa and Angola, and the Swapo expected to resume in the near future.

Independence movement, are in Pretoria. Yesterday's spokesman for South Africa's Foreign Affairs Department declined to comment on earlier reports that tripartite talks on Namibia's future are due to resume on Cape Verde Island.

However, he did confirm that Mr Chester Crocker, the U.S. Assistant Secretary of State for African Affairs, is to visit South Africa in the next two weeks for talks on Namibia's future.

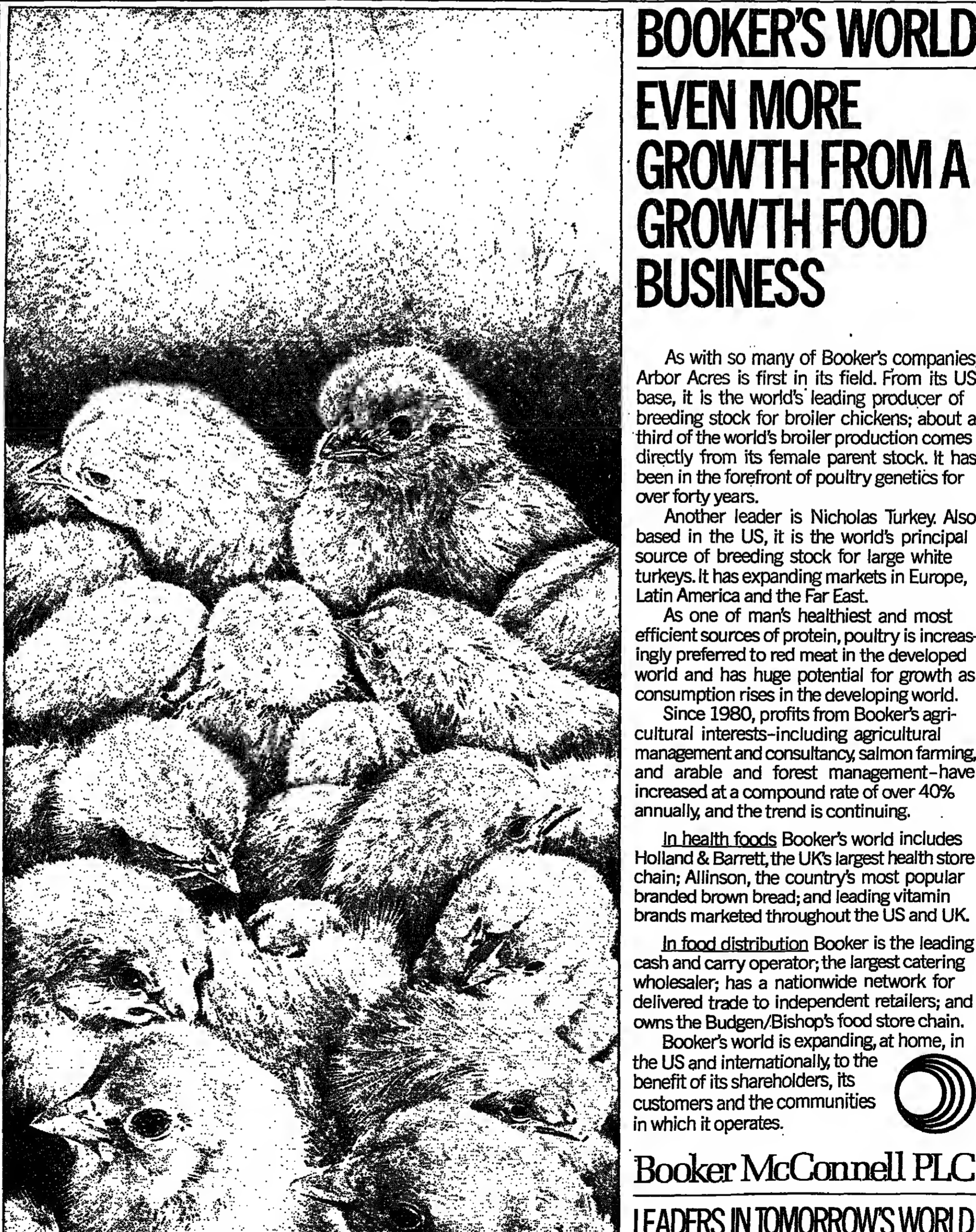
Despite the cautious official approach to the muted Cape Verde talks, South African

government officials say significant developments on Namibia's future are likely very soon.

Addressing a meeting at Pretoria University on Saturday Mr P. Pi Botha, South African Foreign Minister, said negotiations for a Namibian ceasefire had reached a very "critical stage." He said he expected the issue to come to a head in the next few days.

● Schoolchildren in Durban yesterday protested against today's South African Indian elections by boycotting classes.

In another development Mr Louis le Grange, South Africa's Minister of Law and Order, said at the weekend that detention orders had been served on 17 leaders of the election boycott campaign.



BOOKER'S WORLD EVEN MORE GROWTH FROM A GROWTH FOOD BUSINESS

As with so many of Booker's companies, Arbor Acres is first in its field. From its US base, it is the world's leading producer of breeding stock for broiler chickens; about a third of the world's broiler production comes directly from its female parent stock. It has been in the forefront of poultry genetics for over forty years.

Another leader is Nicholas Turkey. Also based in the US, it is the world's principal source of breeding stock for large white turkeys. It has expanding markets in Europe, Latin America and the Far East.

As one of man's healthiest and most efficient sources of protein, poultry is increasingly preferred to red meat in the developed world and has huge potential for growth as consumption rises in the developing world.

Since 1980, profits from Booker's agricultural interests—including agricultural management and consultancy, salmon farming, and arable and forest management—have increased at a compound rate of over 40% annually, and the trend is continuing.

In health foods Booker's world includes Holland & Barrett, the UK's largest health store chain; Allinson, the country's most popular branded brown bread; and leading vitamin brands marketed throughout the US and UK.

In food distribution Booker is the leading cash and carry operator; the largest catering wholesaler; has a nationwide network for delivered trade to independent retailers; and owns the Budgen/Bishop's food store chain.

Booker's world is expanding, at home, in the US and internationally, to the benefit of its shareholders, its customers and the communities in which it operates.



Booker McConnell PLC LEADERS IN TOMORROW'S WORLD

WORLD TRADE NEWS

China plans to open Tibet route

BY K.K. SHARMA IN NEW DELHI

CHINA HAS proposed to India that the ancient overland trade route to Tibet be reopened as a way of significantly expanding Sino-Indian trade. Tibet is a semi-desert, high-plateau province of China that has a long border with India.

The suggestion made to the Indian Government is that it should take advantage of the construction boom in the semi-autonomous region of Tibet, where thousands of new houses and some small industrial complexes are being constructed.

China is apparently finding it expensive to transport the equipment and other building materials from the mainland on the overland route, which goes through extremely difficult terrain.

The overland route to Tibet from India via Kalimpong in West Bengal was closed after the brief but bloody Sino-Indian border war in 1962. Before then, it had been in virtual disuse for several years after the flight to India of Tibet's godking, the Dalai Lama, from Chinese communism in 1959.

India and China held their first official trade talks this month in Peking and set a target of an annual two-way trade of \$2bn within five years from the present paltry \$145m. A most-favoured-nation trade treaty was also signed.

India is going slow on normalisation of economic relations with China because the Government feels that priority should be given to settlement of the contentious border dispute. The next round of talks on that is to be held in Peking next month and it is possible that the trade issue will also be taken up then.

Renner reports from Peking; China will start taking applications from abroad for patents on inventions and industrial designs from October 1, six months sooner than planned, the China Daily said yesterday.

The introduction of a patent system in China has long been awaited by some foreign businesses, which have been reluctant to commit themselves to contracts, especially those involving high-technology items, without protection against copying.

Malaysian PM warns Japan on 'colonialist' policy

BY WONG SULONG IN KUALA LUMPUR

CLEAR evidence that Malaysia's three-year-old honeymoon with Japan is over was provided yesterday by Dr Mahathir Mohamad, the Prime Minister, and architect of the country's "Look East" policy of unabashed emulation of Japan.

Dr Mahathir criticised the present bilateral economic ties, saying the situation in many respects conformed to the "classic pattern of economic colonialism." Japan, he said, bought only primary raw materials from Malaysia and "practically nothing" by way of manufactured goods, even though Malaysia had moved strongly into industrialisation.

Speaking to a group of Malaysian and Japanese officials in the capital, he said that although Japan was a strong opponent of protectionism at international forums, the Japanese market was highly protectionist. He warned that Malaysia could not allow this situation to persist, and might have to retaliate by restricting and buying fewer Japanese goods.

He said this retaliatory action could even be extended to cover ASEAN, the six-nation association of which Malaysia is a member, since other Asian countries were equally frustrated with their economic ties with Tokyo.

Dr Mahathir cited other areas of "economic tension," including the issues of transfer pricing, the growing imbalance in invisibles in Japan's favour,

and Japan's refusal to allow Malaysian Airlines System to make more flights, despite his personal intervention in the matter.

In recent months there has been a critical reassessment of the "Look East" policy by JAPANESE engineers have resumed work on the heavily-bombed Bandar Khomeini petrochemical complex in southern Iran, Reuter reports from Tokyo. About 200 engineers and other staff have recently entered the \$3.5bn complex, which was 85 per cent finished when Iraqi bombing forced work to stop last February.

Malaysia, but observers were surprised to hear Dr Mahathir speak so harshly against the nation he so admired. The speech reflects his growing disenchantment that Japan had benefited enormously from his policy, without reciprocating.

Malaysian contractors have complained that the Japanese have grabbed all the major construction projects in Malaysia, but failed to transfer technology, as promised. Other Malaysian businessmen and officials have also detected an arrogant and insensitive attitude among their Japanese counterparts, and say this is, in part, due to the Japanese misreading, or exploiting the intentions of the "Look East" policy.

COPENHAGEN HANDELSBANK A/S

Half-Year Report:

Copenhagen Handelsbank made an interim profit of Kr. 414.6 million before provisions for bad and doubtful debts, devaluations, adjustments in the market value of the securities portfolio, extraordinary items, and taxes. This compares with a profit of Kr. 219.8 million for the first half of 1983.

PROFIT AND LOSS ACCOUNT (summary)

	First half of	
(Kroner million)	1984	1983
Interest and commission on advances...	1,538.3	1,542.8
Interest and dividends, etc. on bonds, shares and mortgages, etc.	832.1	494.7
Interest on deposits with domestic and foreign banks, etc.	868.9	706.2
Total interest income	3,239.3	2,743.7
Interest on deposits	1,267.2	1,247.9
Interest on deposits from domestic and foreign banks, etc.	879.2	656.9
Interest on subordinated loan capital, etc.	80.8	88.6
Total interest expenditure	2,247.2	1,992.4
Net income from interest and commission	992.1	751.3
Profit on and value adjustment of foreign exchange:		
Profit on and value adjustment of foreign exchange	72.6	135.5
Exchange-rate adjustment of own subordinated loan capital	+5.6	78.2
Other ordinary income	176.6	161.6
Profit before expenses, etc.	1,247.1	1,012.8
Salaries and pensions, etc.	-579.6	-554.4
Other expenses	-252.7	-238.6
Profit before provisions and devaluations, etc.	414.8	219.8
Extraordinary income and expenses	49.6	23.8
Adjustment for changes in market value of securities	-423.2	1,196.2
Profit including adjustment for changes in market value of securities, but before provisions and devaluations, and taxes	41.2	1,439.6

Prospects for 1984

Against the background of the current prospects for the Bank's business volume, the operating results for the full year are expected to be satisfactory - and this despite the heavy competition that reduces the profit margins on many types of transaction.

Copenhagen Handelsbank has entered into an agreement to sell just over half of its shareholding in Nordfarms-Bank Zürich. On the assumption that the deal receives official approval, an extraordinary profit in the region of Kr. 90 million will be written into the accounts.

The final results for the year will obviously be affected by the behaviour of bond and share prices.

The fall in bond and share prices in the spring caused a substantial imputed loss on the securities portfolio for the first half of the year.

Even though we expect the share market to be more buoyant in the second half of 1984, the level of interest (and hence the market value of the Bank's bond portfolio) obviously exercises considerable influence on the final results.

If the average rate of bond interest at the end of 1984 corresponds to the half-year level, a modest loss on the securities portfolio may be expected.

COPENHAGEN HANDELSBANK A/S

Italy wins telephone contract

By Alan Friedman in Milan

ITALTEL, the Italian state-owned telecommunications equipment maker, has won a \$500m (£217m) contract to supply Guatemala with an electronic digital telephone network.

The network is to be completed in collaboration with GTE and Teletre and will have capacity for 40,000 telephone lines. The project will also include cable and fibre optic transmission systems and urban telephone networks.

ITALTEL exports telecommunications equipment at present to Argentina, Brazil, Colombia, Uruguay and Venezuela. This is the first time it has won a Latin American contract to complete an entire telecommunications network.

The Montedison Chemicals group has signed an agreement with Asahi Glass of Japan to build a new factory near Tokyo for the production of foblin, a chemical used in the manufacture of high technology goods, such as semiconductors.

Under the joint venture Asahi Glass will spend around \$5m to build the factory at Chiba, near Tokyo. The factory will begin production by the end of 1985. Asahi has agreed to sell its entire output to Montedison, a Montedison subsidiary, which will market the chemical in Japan and the Far East.

The Italo-Japanese venture calls for the Montedison group to take control of the plant, after several years of depreciation.

Egypt signs four oil agreements

BY TONY WALKER IN CAIRO

FOUR FOREIGN oil companies, including British Petroleum, yesterday signed exploration and production agreements with the Egyptian General Petroleum Corporation for areas in the Gulf of Suez, the Mediterranean, and the desert Southeast of Cairo.

The agreements are part of an Egyptian drive to boost oil production and maintain a surplus for export in the face of rising domestic demand. Egypt's present production is 750,000 barrels a day, one third of which is exported.

The four foreign oil companies, Esso, Conoco, Getty and BP, have pledged to spend a total of \$201.7m on exploration. Egypt has now signed this year

agreements for 10 concession areas with planned exploration expenditure of about \$485m.

The largest of the agreements signed yesterday involves Esso, a subsidiary of Exxon of the U.S., which has undertaken to spend \$44m over the next 10 years on exploration in a 317,000 sq km concession south-east of Cairo.

BP Development, Egypt Branch, a subsidiary of British Petroleum, will spend \$20m on exploration in a 1,200 sq km zone in the Mediterranean off the coast of Sinai. Conoco's Egyptian subsidiary will spend \$71m over five years, exploring a 681 sq km area in the Gulf of Suez. Getty Oil is to spend \$66.7m to explore a 820 sq km

zone also in the Gulf of Suez.

Egypt plans to sign another three oil and gas concessions this year, as part of its drive at least to maintain oil production at present levels. Under the terms of various agreements signed yesterday, the Egyptian General Petroleum Corporation's share of oil production will range between 55 and 88 per cent.

All agreements provided for the payment of "signature" and "production" levies. According to the annual report of EGPC, eight new wells were discovered offshore in the Gulf of Suez during 1983. In addition, four petroleum and three natural gas fields were discovered in the Western Desert.

SHIPPING REPORT

Concern over industrial disputes

BY DAVID LAWSON

INDUSTRIAL disputes, rather than war activity, dominated the shipping market last week, as reports of attacks on tankers in the Gulf abated and labour problems in Britain, the U.S. and Australia worsened.

While Britain concentrated on its own coal and port problems, the threat was building of a rail strike in New South Wales which could affect supplies of coal to docks. Meanwhile there was a mining go-slow in South Africa and pay talks had broken down in the U.S.

Galbraith's said this might prompt some extra bulk carrier activity from areas still

working normally but it was doubtful whether this would last for long.

One effect of the UK miners' strike had been an oil burn by the Central Electricity Generating Board of about 500,000 tons a week, mostly imported through 50/60,000 deadweight ton vessels from the Caribbean, the Mediterranean or the Continent.

In spite of this extra activity, Galbraith's says that the market for this type of vessel remained low and rates had hardly been affected. "Perhaps there is a lesson to be learned here," they say. "One often wonders why

this type of ship continues to be built when 50,000-ton tankers and OBO class tonnage are unable to load the classical 500,000 barrels of crude (approximately 65,000 tons)."

These vessels were rarely able to trade in crude oil movements, especially from the North Sea.

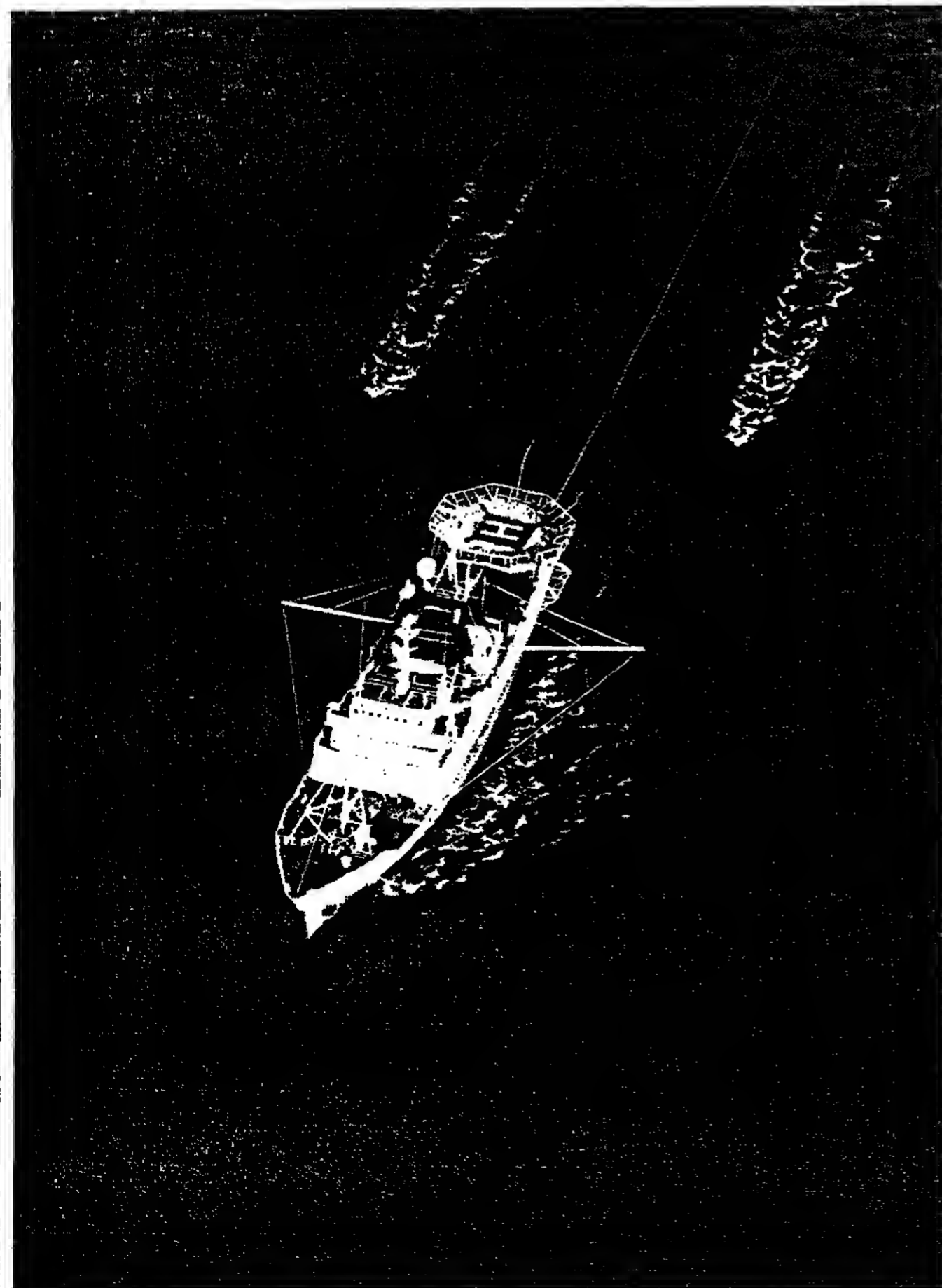
Tanker rates improved in the Mediterranean last week, giving owners a slightly higher return. But this was not the case in West Africa, where Amoco fixed 130,000 tons to the UK and Continent for worldwide \$3.5 and to the U.S. Gulf for 31.5.

WORLD ECONOMIC INDICATORS

FOREIGN EXCHANGE RESERVES - US\$m

	June '84	May '84	April '84	June '83
U.S.	6,229	6,430	6,594	7,850
Japan	21,002	21,150	21,179	20,502
W. Germany	32,724	39,659	40,938	37,692
UK	7,057	7,508	7,777	8,948
Italy	17,920	17,522	17,257	16,943
Netherlands	8,034	8,580	8,705	8,890
Belgium	3,159	3,174	3,445	4,344
France	19,304	18,935	18,531	16,883

Source: IMF



How does Seisella expect to find North Sea oil and gas deposits that have been overlooked before?

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Seisella's instrument room is the nerve center of this complex data gathering operation. Here millions of bits of data are digitally recorded in preparation for computer processing. In areas of high interest, data can be recorded with such high resolution that three-dimensional maps can be made of the strata beneath the sea.

As a result of this improved detail, Seisella can help find commercial deposits of oil and gas

that might have been overlooked. Fewer wells may have to be drilled to delineate a field. And the time between discovery and production may be substantially reduced.

In fact, savings for oil companies can be significant even when no oil is found. If drilling even one dry hole is avoided, the cost of the survey is more than justified.

Seismograph Service Corporation operates on land and sea, and is a global leader in applying high technology to the continuing search for ever scarcer energy resources.

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UK NEWS

Industry draws up plans to cope with dock strike

BY OUR INDUSTRIAL STAFF

BRITISH companies spent the bank holiday weekend drawing up contingency plans to deal with the effects of the national docks strike called last Friday. They drew comfort, however, from the decisions at some ports to continue working.

The Association of British Chambers of Commerce said: "This dispute looks as though it will be less damaging than the 'predecessor'". The association said the cracks in the dockers' solidarity would allow goods for export to be diverted from a strike-bound dock to a working port.

The Confederation of British Industry (CBI) gave a warning last week that a strike might bring 75 per cent of industry to a standstill within weeks. It remained cautious yesterday, but pointed out that a partial closure of ports would be quite different from a total strike.

North Sea commitment sought

BY DOMINIC LAWSON

THE DEPARTMENT of Energy's North Sea watchdog, the Offshore Supplies Office (OSO), is to hold a series of meetings with international oil companies in an unprecedented effort to expand UK involvement in research and development for the offshore oil industry.

The move follows a letter sent to all companies that have indicated their intentions to apply in the forthcoming ninth round of UK oil and gas licences.

The letter, sent by Mr John d'Amico, the director-general of the OSO, asks all the recipients to say what they have done for UK research and development in the past and what they propose to contribute in the future.

British spending on ships falls 36%

BY DAVID LAWSON

SPENDING ON new and second-hand vessels by the UK shipping industry fell by 36 per cent last year to £250m net of disposals. The decrease was because fewer new ships were delivered.

Public-sector spending on new ships also fell by 36 per cent to £7m, while the private sector cut the bill for alterations by almost 40 per cent to £31m.

In 1983 the industry received orders for 54 new ships worth £365m, a fall of £160m over the previous year. UK yards built 34 ships.

Americans lead tourist invasion

By Lisa Wood and David Churchill

PROVISIONAL tourist statistics show that 3.15m people visited Britain in the period March to May this year - an increase of 14 per cent over the same period in 1983.

Lamb dispute shows lack of EEC rules

BY ANDREW GOWERS

THE LATEST Anglo-French fracas over the lamb trade has jolted experts in London and other EEC capitals into taking a new look at the question of chemical residues in meat. It has also exposed the wide gulf between approaches to the issue in different countries.

It is into that institutional vacuum that France has stepped with its tight controls on lamb containing more than one part per million (ppm) of Lindane. Any supplier of sheepmeat to France whose consignments repeatedly show higher residue levels than that will find himself barred from the market.

Perhaps surprisingly, given the Community's power over so many aspects of what we eat, it has no common rules on the overall question of unwanted chemicals in food, or how to detect them. It can ban the use of individual pesticides - as it has done with DDT for example - or of growth-promoting hormones in animals, such as those found in large quantities in veal from continental Europe a few years ago.

Lindane, otherwise known as gamma-HCH, is the active ingredient of most commonly used dips against sheep scab, a pernicious and highly infectious disease caused by mites burrowing under the animal's skin.

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THE MANAGEMENT PAGE: Small Business

When redundancy can lead to a new start

BY TIM DICKSON

TAKE ONE key executive of the dote queue, mix with a small firm poised for expansion, and if all goes well you should have a cost-effective recipe for long-term employment growth.

That at any rate was the theory behind Expand-a-Firm—an imaginative if necessarily small-scale experiment initiated in 1981 by Dr Meredith Bebbin of the Cambridge-based Employment Development Unit with modest funding from the Manpower Services Commission (MSC).

Three years later Expand-a-Firm has not quite run its course but Bebbin is nevertheless sufficiently self-confident to be claiming success. In a new booklet which details among other things the results of the scheme so far he maintains that a significant number of new jobs have been created and that the effects "are real and not illusory."

Development Fellows (as the redundant managers were somewhat grandly called) were carefully matched with 11 companies, most of them in Wales and the Midlands, between mid-1981 and mid-1983. Under the terms of the programme, they were paid £7,000 for a year but the hope was that the service company would find them so useful in their work they would be offered a full-time job. This had happened in six of the 11 cases where managers had been taken on more than 12 months before the booklet was written (though one was later dismissed on personal grounds).

Moreover, a total of 59 new jobs were generated following the appointments of the "Fellows" and a further 16 were "saved from certain extinction" in a company suddenly laid low by the death of its managing director—though Bebbin wisely qualifies his findings with reference to "the argument that these firms might have generated jobs anyway even if they had not been assisted."

In view of his apparently impressive hit rate, it is perhaps a little ironic that the MSC has since set new objectives for its spending and subsequently refused further financial support for Expand-a-Firm.

Significantly, however, the MSC is firmly committed to the idea of "marrying" redundant executives with small com-

panies through its nationwide Management Extension Programme—a differently structured project involving substantial numbers of businesses (750 this year) and run with the co-operation of more than 20 universities, polytechnics, regional management centres and private consultants. By comparison, Expand-a-Firm was inevitably seen as somewhat elitist as well as being a test-bed for some of Bebbin's earlier research. It was based on his personal hypothesis that the key to regenerating a depressed region "lies in taking the fullest advantage of the under-utilised manpower resources that a region possesses, especially at the top end of the skill spectrum."

Selection of candidates

Much, of course, depends in an experiment of this kind on the choice of company and candidate—a point which Bebbin was careful to take into account. Firms were chosen which ideally had some sort of "unique selling potential" and in which the manager foresaw the need for a colleague whose personal contribution and capacity for responsibility was capable of enlarging the scope of the company. The assessment of such individuals was influenced by a study carried out by the Industrial Training Research Unit (ITRU)—a research organisation previously run by Bebbin and Henley Management College on the difference between successful and unsuccessful management teams. The most successful, it was found, contain executives with contrasting qualities and complementary skills, who have found their true team role and have learned to pull together. Application of these methods and techniques became an integral part of the selection of suitable candidates for the development of small enterprises.

The Management Extension Programme (MEP), by contrast, relies largely on a special MSC training programme which all redundant executives attend ahead of their secondment (in this case it can last for anything between 10 and 26 weeks). The aim, as an MSC spokesman put

it, "is to supplement their existing skills with small business management techniques, to get over the point that small business resources are slender by comparison with big and that they may find different standards in the areas of, say, health and safety at work."

The MSC only pays the executive a modest training allowance equivalent to the unemployment pay and social security benefits which he or she would otherwise have been collecting.

Preliminary research at Durham University Business School suggests that the Management Extension Programme is a cost-effective way of creating jobs and a more detailed report is expected to be published later in the year. The MSC certainly seems to prefer this approach to Expand-a-Firm, though in his booklet, Bebbin argues that based on a total expenditure of £57,225 in direct salaries plus national insurance, the cost per job at £719 is certainly low "by comparison with the scale of public expenditure needed to create large production units in depressed areas."

Encouraged by his results Bebbin is turning to local authorities and he secured a contract with Cambridgeshire County Council for a new programme called CEBEE (Combined Employment and Business Expansion Enterprise). A local fund financed by the assisted company, private investors and public sources, will back it. Companies that lack cash will be issued shares redeemable at the issue price if employment targets are met or at a special premium if they are not. Shares not redeemed will be passed to investors in the fund.

"If CEBEE succeeds in its social and employment aims," explains Bebbin, "the local investor has made a worthwhile contribution to a community cause. If it does not succeed in creating jobs... but leads instead to high productivity and business growth, investors will have made a sound investment."

"Countering Unemployment" is available from The Employment Development Unit, 1 Silver Street, Cambridge CB3 9EL. Price £3 post free. It also includes an assessment of Create-Your-Own Job, another small scale experiment aimed mainly at young artisan entrepreneurs.



A mixed experience

TWO YEARS ago Jim Robertson (above), proprietor of North Wales-based Dee Electronics, had just taken an Expand-a-Firm Fellow personally onto his payroll. Robertson had been delighted with his performance over the previous 12 months and had decided that the skills of this former big company executive were well worth paying for out of the company's own resources.

Unfortunately, however, this honeymoon period did not last and several months later the two men parted company after a clash of ideas.

Happily, the incident has not hampered Dee's growth for Robertson now employs 32 people (compared with 20 previously), has just taken the next door unit to make room for expansion, and is currently in negotiations with the Welsh Development Agency to build his own purpose-built unit in a year's time. His erstwhile employee, moreover, has also benefited in that he is now self-employed.

"His main contribution," recalls Robertson, "was to take the pressure off me. He gave me greater scope and more time to expand the company's activities in other directions. We have become more innovative and are helping our customers with design and development, as well as with straightforward manufacturing."

Robertson says he would probably have taken on somebody like the Fellow in any case, but admits it is easy to say this with hindsight.

Bebbin's booklet contains three other case studies of companies where the experiment paid higher dividends

U.S. antitrust

How not to put a foot wrong

BY TIM DICKSON

ANTI-TRUST legislation in the United States is widely agreed to be a legal minefield for the uninitiated. But according to Dr Richard Haas and Lord Lloyd of Kilgerren—two international lawyers with wide experience in this field—there is a relatively simple but surprisingly little known "clearance" procedure which may be particularly helpful to small UK firms entering into licensing agreements with U.S. companies.

British companies contemplating marketing or manufacturing agreements will almost certainly need to take full legal advice. But the U.S. Department of Justice procedure known as the "business review letter" can assist them to establish whether their proposals will be considered anti-competitive under U.S. law. Though the Department of Justice is not authorised to give advisory opinions to private parties, its Antitrust Division is, in certain circumstances, willing to review the proposed business conduct of companies which

have negotiated or are in the process of negotiating licensing agreements.

The procedure requires the "requesting" parties (that is the UK firm and its U.S. partner) to make a full and accurate disclosure of the proposed business conduct for which the review is sought. Background information, complete copies of all documents and detailed statements of all collateral or verbal understandings must accompany the relevant data. Moreover, the Antitrust Division can ask for any additional information and can undertake an independent investigation if necessary.

Under the rules of the scheme, companies can only rely on a business review letter if signed by the assistant attorney general of the Antitrust Division or his delegate; that letter will not cover any party other than the firm to which it is issued. It will state only the Department of Justice's intentions under antitrust legislation at the date it is signed, and the Antitrust Division remains

free to bring an action or proceeding if it is subsequently decided that this is required in the public interest. A request for the Department of Justice to be free either to state its present intention as to enforcement, or decline to make any statement, or to take any other position or action it considers appropriate. The business review request, all the information supplied and the division's reply will subsequently be indexed and placed on a file available to the public—though companies can ask for some or all of the information to be temporarily withheld.

When these procedures have been carried out the file remains open for a year, after which it is closed and the documents either returned or disposed of at the discretion of the Antitrust Division. Antitrust Division will apply for a "Business review letter" is available from the British Overseas Trade Board, 67/13, Rother Street, 1 Victoria Street, London SW1E 6ET. Tel: 01-215 0428.

In brief...

QUESTER Capital Management, a company jointly owned by ex-ICFC managers Andrew Holmes and John Spooner, stockholders Quilter Goodson and the National Coal Board Pension Fund, appears to have backed the Business Expansion Scheme trend. While most BES funds this summer have been struggling to reach their minimum targets, Quester says its new Quadrant Development Capital Fund 1984 has successfully pulled in £2.5m. Not only was this close to best expectations, it makes the fund one of the biggest to be established so far this year.

Quilter Goodson's strong private client base, of course, was a big help and Holmes admits that "in the region of 70 to 80 per cent" of the subscribers came through this source. It is nevertheless a significant filip for the BES which, judging by the previous response to funds, seemed to be getting cold-shouldered by investors. Holmes, who also has plans to manage venture capital on behalf of institutions, insists

that he is looking for young growing companies. "Although we might do one or two asset-backed deals like hotels later in the year to get a spread, we will not be relying on this as a defensive tax shelter."

STEWART Fund Managers, meanwhile, is also pleased at raising just over £1m from 119 participants for the Stewart Business Expansion Fund 1984 which closed last week. Stewart regards the result as "very successful in what has been a difficult period for the launch of new funds for this nature," adding that the amount raised is big enough to allow a diversified portfolio of investments in the current tax year.

Many eyes, however, will be focused on the Hoare Octagon BES Fund which is due to close at the end of August. Unlike all other BES funds, Hoare Octagon will specialise in one sector (Information Technology)—so the response to this idea will be closely watched by its competitors.

ONLY A nation which invested the largest sum of money also refer to the "branching."

According to a new layman's A-Z of Franchising by John Adams and Kenneth Frithard Jones, this is an American term meaning "a branch of the franchisor which itself operates in the market for the franchisee." The English term, the authors add, is "master outlet." "F" is for Franchising, as the booklet is called, is a kind of dictionary for prospective franchisees which besides explaining special terms, tries to point to some of the problems which may be faced both before and after entering into a franchise agreement.

Notwithstanding the relatively low risk of failure (compared with other business activities), the authors warn that franchisors have been misled by unscrupulous salesmen. The book "is intended to help prospective franchisees ask the right questions and to encourage them to make sufficient investigations into the franchisee on offer."

Available from Azed Publications, 31 James Street, London W1E 6HS. Price £2.75 inc p+p.

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THE ARTS

The Edinburgh Festival has never really come to terms with the visual arts, never accepted them fully as a central and necessary element in its make-up.

Visual feasts of the Festival and beyond



Top, Paolozzi's "One Party in Three Parts" (1952 collage); and Picasso's "Cat and Bird" (1939)

But Scotland's most important art event of the year coincides with, rather than belonging to the Festival—the reopening of the Scottish National Gallery of Modern Art in its handsome, splendidly adapted and ample new home.

Japanese Theatre, a perfect Mondrian, cubist still lives by Picasso and Braque. Epstein's amazing Consummation Est lies in its special tomb at the corridor's end.

a fearsome Gésar scorpion and a predatory Picasso cat. "Creation" is sponsored by IBM and remains on show until October 14.

So back to the Festival proper and to Demarco's at the Edinburgh College of Art. Richard Demarco, whose creature it is, has been for nearly 20 years a mainstay of the Festival in its visual aspect.

Demarco, therefore, is diffuse and disorganised, uneven and unpredictable, but it is not uninteresting and by no means a failure. Good galleries have come forward to take the place of the Gallery, the Scottish Gallery, Coracle, Robert Fraser, Gimpel Fils, Blond, Brompton, Murdoch, Lotman, Bruton, Canada House, Garton & Cook, the Galleria Cavalino from Venice.

It does go on to Michich, Colopae and Breda, so I may well have the chance to return to it, at least in spirit. Its title, Recurrent Themes, is explicit enough; and through all the digressions and diversions of a long career the love affair that once with junk and the highest technology, Desperate Dan and the Scientific American, we see clearly that the principles of collage—breaking down, reassembling, breaking up again—informed everything he has ever done.

East Berlin Ballet/Edinburgh Festival

Clement Crisp

When jesters and ideology take over Swan Lake, then the production is doomed. When the staging further proposes Chalkovsky's integral 1877 text (itself an ill-balanced first attempt at ballet scores) and uses this for an action, largely unrelated to the original libretto and wholly re-choreographed, about "a young man who has to be made submissive in order to be integrated into his environment, then it is doubly doomed.

version of Hamlet which had by mischance decided to use Chalkovsky's music. I came to realise that the mistake was not mine but the Komische Oper's, and that the grey concrete palace setting filled with gauzy consuming (the women be-bustled like Rod Hull's Emu), with Siegfried, Prince of Denmark, emoting all over the stage while the Princess Mather and von Rothbart impersonated Gertrude and Claudius, and the pas de trois was given over to the jesters' brutish miming of the play-scene, was indeed some cruelly mutated form of Swan Lake.

London Sinfonietta, Nexus/Albert Hall

Andrew Clements

An exotic confection for Friday's Festival, the London Sinfonietta provided the substance, the Canadian percussion ensemble Nexus the lighter-weight filling. If it made for an over-long, slightly indigestible sandwich (with two intervals there were at least two rewarding revivals included in the Sinfonietta's contribution.

conducted a scrupulously detailed account. Lothar Zagrosek took charge of the remainder, ending with Ligeti's Adventures, Nouvelles Aventures, Domine, and Muldowney's Saxophone Concerto, a Sinfonietta commission during last season, preceded the knockabout music theatre, and proved at first hearing a puzzling thing indeed. It is at once a superbly successful vehicle for the soloist, John Harle, and a colourful exposition of Muldowney's highly flexible and polyglot idiom. But there seems to be a deeper, less comfortable vein running through it, a desperation about its mosaic of high-band dance tunes in the finale, a wistfulness about its central variations, that suggests a more disquieting subtext.

The Devils/The Pit

Michael Coveney

Based on Aldous Huxley's The Devils of London, John Whiting's 1961 play was the first new script performed at the Aldwych by the Royal Shakespeare Company. The revival in the Barbican studio is in some ways a denial of the play's epic grandeur, but a more intimate re-exposition of its themes.

Neither is the ambiguity solved in Estelle Kohler's brave performance as the crop-haired priestess who is riddled by the power of her own masturbatory orgasm and later exposed as a Pious fraud.

Achucarro/Elizabeth Hall

David Murray

For his South Bank Summer Music recital on Sunday, the pianist Joaquín Achucarro played the complete Goyescos of Granados, preceded by the Bach-Busoni Toccata in C. Not so much a programme as a resounding collision, even with an interval between them; presumably he works that Mr Achucarro just likes playing. He is a redoubtable performer, always incisive (even ungentle) and of unflagging power. In fact, the uniformity of his style when some considerable way toward concealing the differences between Bach-Busoni and Granados.

sharply declamatory and busily athletic, and heavy. The character of the music scarcely survives, and many passages sound homeless without it. Achucarro gave it a grand-scale performance, with plenty of impersonal fire and some flinty tone. There was little of the sense of improvisation that best every piece in it (except the overture "Maiden and the Nightingale") is over-long. The frail, romantic Granados personality is genuine, his Spanish gestures since if refined, his piano-writing elegantly effective—and much of a muchness. As a sequence, the pieces disclosed too little expressive variety (except perhaps to the ear of the faithful), none of the intimate quietude that can add fresh sense to otherwise repetitive writing. It was a curiously sober performance, despite its force and its dedicated efficiency. I think Granados thrives better on a smaller, more vulnerable scale.

Scottish sponsors increase

Scottish Arts Council. But in spite of the growing number of sponsors, the overall financial picture is bleak.

The number of business sponsors for Scottish arts organisations has increased by more than 10 per cent in the last year, according to the results of a sponsorship survey recently completed by the



Peter McEnery and Estelle Kohler

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Arts Guide

A selective guide to all the Arts appears each Friday.

Arts Guide table with columns for location (LONDON, SALZBURG FESTIVAL, WEST GERMANY, VIENNA, CHICAGO), event name, date, and details.

TECHNOLOGY

TOMORROW'S ELECTRONIC COMPONENTS MAY RELY ON THIN LAYERS CALLED SUPERLATTICES

GEC invests in tools for future chips

By DAVID FISHLOCK

GEC—indeed Britain—missed out on the big innovations in silicon chips, which have been dominated by U.S. and Japanese research centres. But the company is planning heavily on what it believes may emerge as the semiconductor technology of the 1990s and beyond.

This is a technology which scientists believe could support silicon for chips in the tens, even hundreds of millions of electronic components, compared with hundreds of thousands for the biggest integrated circuits sold today.

But the challenge is not only the first billion-part chip. "The really exciting thing is that these could be some genuinely new devices," says Dr. Derek Roberts, GEC's director of research, and Lord Weinstock's chief counsel on new technology.

He believes fervently that the electronics industry is urgently in need of a better idea than "screwing more and more on to a single silicon chip."

The lure of a new kind of physics forging new relationships between industry and universities in Britain. University departments which previously competed fiercely for funds are forming consortia in the hope that government will thus be persuaded to pay for the expensive new tools the new physics needs.

The bonus could be a much more efficient partnership between academia and industry, in which each understands more clearly the part the other must play, and scientists move more freely between the two worlds.

The field for this experiment is the physics of low dimensional structures. It was opened a decade ago by an IBM scientist, Dr. Leo Esaki, a Nobel prize-winning physicist at the Watson Research Centre near New York.

He had the idea of making "sandwiches" of different materials, each only a few atoms thick. He called his sandwiches "superlattices."

When Dr. Esaki first proposed that superlattices be used for making things he was known. Later he invented a way of evaporating the layers, called molecular beam epitaxy (MBE).

In fact, the novel electrical properties Dr. Esaki predicted for his "sandwiches" did not appear. What appeared were other idiosyncrasies "at least as

advantageous," to quote Dr. Cyril Hillsom, chief scientist of GEC. The electronic and optical properties of the sandwiches are fundamentally different from those of bulk material. "It's a new physics," he says.

By 1982 the world of semiconductor research recognised that Esaki's sandwiches could be the chips of the future. Over 500 scientific papers on the subject were published that year.

The excitement is not only about much more densely packed chips, or switching at 100 times today's speeds, but about the possibility of combining in one chip the properties of materials previously hard or impossible to marry. At the thicknesses involved, the films behave like thin films, stretching or contracting to conform to the layer beneath.

In MBE, films are deposited by the evaporation of a high vacuum. Their vapour, unimpeded by other atoms, streams off in straight lines to fall upon the scientist's target.

Typically, the latest MBE machines — highly crafted pieces of engineering in stainless steel costing as much as £500,000 — lay down a layer one atom thick each second. With careful timing the scientist can keep each layer to just a few atoms of absolutely pure material. Upwards of 100,000 could be stacked in the thickness of a coin.

The thinner and purer the layers of the sandwich, the more exotic the properties seem to be. There are rival techniques, such as metal organic chemical vapour deposition (MOCVD) in which Thomson-CSF in France is a leader. It may prove simpler to put into production, but the common factor is the need for a very high vacuum — higher than any other industrial process so far — if the sandwich is to be kept pure and free from atoms of oxygen.

GEC scientists admit that they sit on the sidelines during an exciting period in which the science was evolving from the late-1970s, convincing themselves that it was not just another semiconductor bandwagon. "Now there is no doubt," Dr. Hillsom says.

Dr. Hillsom has recruited a team of 12 — including a professor of physics at Cambridge — to make the new physics. This "chief scientist's team" is taking an even longer term view than

GEC's long-range research laboratory (which also comes under his wing), five to 10 years, compared with two-seven years.

The new team, under Dr. Mike Kelly, is pooling the interests of five different GEC laboratories in a top-priority programme of "atom engineering."

GEC has recently installed two machines for MBE technology at Wembley and plans to have two more machines for MOCVD technology. As Dr. Roberts sees the investment, MBE is the most promising technique at present, but he is not yet convinced that MOCVD has been fully stretched.

In addition, he himself is pressing the suit of a third technology, a personal enthusiasm based on using a powerful ultraviolet laser to lay down layers of atomic dimensions. He believes it could yet prove simpler to manage than its rivals. He calls it "the poor man's MBE."

This major GEC effort is also being married to that of two national centres of expertise in the technology, at the Royal Signals and Radar Establishment and the Marconi Laboratories of British Telecom.

So confident is Dr. Roberts that the new physics of sandwiches — "nanometre microelectronics," as the Japanese call it — will lead to major advances in electronics and optoelectronics, he is also a prime mover behind efforts to persuade the Science and Engineering Research Council to make a major national investment in British universities.

The argument here is that, academically, Britain is well ahead of the new physics but its scientists have been obliged to rely on others to produce their samples in a "process-and-favour" basis. It is proposed that the SERC should now make a substantial investment — as much as £20m, some say — to equip British universities with the machines.

SERC is sympathetic but seriously short of cash. It has been lobbying government for an extra £88m to support promising new areas of science. So far with no sign of success. It is now conducting reviews of its most expensive areas of science support for the universities — space science and atom-smashing — to see whether

forward data to the appropriate alarm company's central station. On the alarm company's console, the risk can be identified and assessed, and if necessary the emergency services, police and proprietor of the premises can be telephoned.

The problem is displayed in plain English or can be printed out to give a permanent record. The scanners and the computers belong to BT and are sited for best security and operating efficiency. The security company owns the STU and operates the central control. To install the system on the premises to be protected costs about £500 for a typical small, two-storey building, including sensors, STU and wiring. The charge for using CARE is levied by the security company and might vary between £100 and £300 a year.

These companies will sell, install and service the total installation and at the moment they include Arles Court Security, Britannia Security Systems, Group 4, Honeywell Shield, Modern Alarms, Securap, Security Centres and Sureway Security.

Great care has been taken over the security of the system itself. For example, the location of the computers is being kept secret.

SECURITY COMMUNICATIONS

Telephones on house alert

BRITISH TELECOM is introducing a security communications system in London in conjunction with several security companies that offer "central station" security monitoring services for premises over phone lines.

Base Ten Systems, the Fleet, Hampshire electronics company, will provide about £0.5m worth of equipment.

The telephone communications and computing segment of the system, from BT, is called Red Care. It provides an alarm carrier service over continuously available telephone lines from the protected premises, via the local exchange, through to a central monitoring station.

The equipment on the protected premises, the subscriber terminal unit or STU, is permanently connected to both the security sensors and the subscriber's telephone line. No dialling is involved and the line is also always connected to the special monitoring equipment in the local telephone exchange.

The subscriber can continue to use the telephone in the normal way and is unaware of signalling activity by the security system, which operates on two channels at frequencies too low to be audible.

Up to 11 of the usual sensors, including smoke detectors, pressure switches, movement detectors, window and door opening detectors, can be connected to the STU. When one of them operates, producing a simple on-off action or change of voltage level, the first of the channels is activated.

The effect is to remove the signal from the line — which will also happen if the line is cut, "making the system fail" — and the signal is transmitted in a format that is specific to each subscriber. There is, therefore, no prospect of criminals buying a system in order to discover the signal format.

At the exchange, an electronic scanning system continuously examines each of the customers' lines, detecting change within a fraction of a second.

Then, channel two, a data transmission channel, comes into action. This allows the STU to call the exchange equipment "what kind of emergency has occurred and which of the sensors (all 11 of necessary) have been activated. The scanner can acknowledge these signals and the subscriber is notified by the STU for later examination.

The local exchange scanners are connected over dedicated private phone lines to the Red Care dual computers, which

storing records and quickly retrieving information. This is a microcomputer version of a system which has been running for several years on larger computers.

The software is designed to handle information such as technical data, personnel records and statistics. An optional (theft) alarm can be incorporated where hunting for related topics. On a 10 Mbyte system, MicroCAIBS can handle more than 10,000 records — each up to 500 characters long.

In May, the company sold part of its business to McCormack and Dodge in order to concentrate on the development of its own software products mainly for the larger organisations.

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OPTOELECTRONICS AND MACHINES

Light sensors

MACHINE TOOLS that form part of the automated factories of the 1990s could bristle with tiny optoelectronic sensors that record wear of cutting mechanisms and the way that the tools are shaping metal parts.

That is the hope of Professor David Whitehouse, head of the centre for micro-engineering and metrology at Warwick University. He is participating in a research programme with industry to design such sensors.

By removing the need for a person continually to monitor cutting activities, it could hasten the trend to unmanned machining in engineering factories.

Interest in Prof. Whitehouse's work is not confined to Britain. One of the longest-standing programmes of engineering co-operation between Britain and the USSR, Soviet scientists and officials regularly making an incursion in a piece of metal signals from the sensors are fed into a computer.

The mechanisms record information about, say, the rotation of a cutting device in a lathe or the depths to which tools are making an incision in a piece of metal. Signals from the sensors are fed into a computer.

In the second area of work, researchers at Warwick are developing sets of computer instructions that take readings from several different sensors and turn them into meaningful information.

In this way, a supervisor could monitor the output of an array of unmanned machine tools while sitting in front of a computer screen on the other side of the factory.

No machine tools in Britain incorporate these types of sensors at present, according to Prof. Whitehouse. But several companies in the machine-tool industry are showing interest.

The work of the centre has two main components. First, researchers design chip-based sensors which may combine in an array of a few square millimetres a semiconductor laser, logic circuitry and a detector that registers electromagnetic radiation.

The sensors are made from materials such as gallium arsenide. Electronics companies, for example Plessey would produce the hardware from specifications produced by the Warwick workers.

The devices are fixed to suitable points on machine tools or on other manufacturing hardware, for example equipment that turns out metal sheets in a steelworks.

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ASTRONOMY

World's largest telescope

JAPAN will build the world's largest telescope on the island of Hawaii by the early 1990s, according to an astronomer from American companies, The University of Hawaii.

The telescope will be equipped with a 7.5-metre (24.5-foot) reflector, bigger than the world's present largest telescope, the six-metre (19.5-foot) reflector at Zelenchukaya in the Soviet Union's Caucasus mountain range. Professor Keiichi Kodaira of the Tokyo National Observatory said.

The Observatory, housing the computer-controlled telescope, will be constructed on Mauna Kea on Hawaii Island at a cost of about ¥20bn (U.S.\$32.6m).

There are already observatories atop Mauna Kea operated by the U.S. National Aeronautics and Space Administration, the University of Hawaii and a joint French-Canada-Hawaii state government team. Britain and the Netherlands are also constructing a joint radio telescope atop Mauna Kea.

The Japanese telescope will have a resolution capacity distinguishing a five-centimetre (two-inch) object from a distance of 100 kilometres (62.5 miles), Kodaira said.

The telescope will enable astronomers to probe stellar objects more than 10 billion light years away on the edge of the known universe.

The good news is FERRANTI Selling technology

Semiconductors Japan opts for chips of the future

FUTURE electronic chips are likely to benefit from a manufacturing process recently developed by the Japan Research and Development Corporation.

The process relates to the manufacture of integrated circuits from gallium arsenide. This is forecast to become the starting material for future high speed chips destined for the fourth generation computers.

Research at Tohoku University led by Professor Junichi Nishizawa have developed a process called photomolecular layer epitaxy. This is a way of controlling the growth of very thin layers of material — the order of molecules thick — to build up the chip.

The process also operates at much lower temperatures than conventional ones — down to 350 degrees C compared with 600 degrees C. It needs an ultraviolet for operation and uses gases targeted onto the surface of a gallium arsenide substrate.

The researchers have already built transistors using the technique.

Moving shoes

CLARK'S, the largest shoemakers in Europe turning out 400,000 pairs of shoes a week with up to 50,000 different products and 10 variations in box size.

Since the stock market has tumbled sharply along with the drop in the yen, the yen-vertible bond issues, which were proceeding smoothly in both domestic and overseas markets, are showing signs of slowdown.

The Japanese bond market is thus increasingly sensitive to the movement of U.S. interest rates. If the U.S. interest rates continue to rise and the yen and Japanese bond market continue to fall, one unavoidable consequence seems to be an across-the-board change in long-term interest rates. A rise in long-term interest rates, however, will not lead to a change in the monetary policy, given the current trend of domestic business and prices.

Upping of business is leading to a surge in demand for operating and capital funds from smaller- and medium-sized corporations of late, and financial institutions are showing willingness to meet the rising fund demand.

Under the circumstances, the Bank of Japan has allowed city bonds to increase leading by 39.9 per cent, or ¥2,780 billion over a year earlier for the three months from July to September. Corporate finance thus is expected to stay lax in the months to come.

DKB ECONOMIC REPORT August 1984: Vol. 13, No. 8

18-month-old recovery in Japan gathers momentum as domestic demand picks up

This year's growth rate projections for all of the OECD economies have been revised downwards. The Japanese economy is also quickening, led by vigorous expansion of the U.S. economy.

After hitting a low point in February 1983, the Japanese economy has been in the process of recovery. It is looking increasingly bright as recovery of private demand has become clearer.

Recovery of business capital investment has been particularly pronounced. It was responsible for 0.8 point of the 1.1 per cent gain in gross value added in private demand in the first three months of this year over the preceding quarter. Capital spending is believed to have continued to be strong in the subsequent months in the light of the rise of orders for machinery, a leading indicator, among other things. The Bank of Japan's short-term business survey (made in May) underscored the trend by showing that spending manufacturing concerns' capital investment programs for fiscal 1984 are 11 per cent ahead of their spending in fiscal 1983.

Another area of recovery is housing. Housing starts stayed above the year-earlier level for four months in a row since February: the year-to-year increase was particularly large in April and May — 10.9 per cent and 16.8 per cent, respectively. Housing investment appears to be coming out of the prolonged doldrums that set in following the second oil crisis, thanks to continued stability of building costs and a lowering of the housing loan interest rate (city banks, for example, reduced the rate to 7.92 per cent in April, the first time in about five years that it has come below 8 per cent). A continued moderate recovery is considered to be in store.

It also looks safe to assume that personal consumption will

perk up gradually with summer sales and leisure activities as boosters. There are a few potential concerns that support this assumption — increasing overtime income and employment, coupled with summer bonuses which are believed to have grown by a margin larger than last year's. Thus, growth of disposable income is likely to pick up gradually.

In the meantime, exports, the locomotive of business recovery, are maintaining a robust upward. On a customs clearance basis, they increased 20.3 per cent during April through June over the corresponding period of last year. Those to the U.S., a market that accounts for about one-third of Japan's total exports, posted an outstanding increase of 49.4 per cent. The growth rate, however, is expected to slow down in the months ahead because the U.S. economy is forecast to expand at a more sober pace in the latter half of the year.

Despite a likely slowdown in expansion of exports, the Japanese economy will continue to achieve balanced growth for the time being because domestic demand stands to assume increased strength from a pickup of not only corporate capital investment, but also of personal consumption.

Continued stability of prices

One feature of the present recovery process is continued stability of prices. In June, for example, wholesale prices remained flat from the preceding month and went down by 0.4 per cent from a year earlier, while consumer prices in Tokyo dropped 1.0 per cent from the preceding month (but up 2.4 per cent over a year earlier). There are three factors that explain the remarkable price stability:

1) Fall of unit production cost due to moderate wage increases for two consecutive years (4.4 per cent in 1983 and 4.6 per cent in 1984), coupled with a sharp rise of the operating rate (an increase of 13.8 per cent between February 1983

Comparison of GNP and Prices in Recent Economic Recovery

1983 1st qr-1984 1st qr
1977 4th qr-1978 4th qr
1975 1st qr-1976 1st qr
1978 4th qr
1984 1st qr

Since the non-merchandise trade deficit is stabilized at an annual rate of approximately \$10 billion, any increase in trade surplus leads to an increase in current surplus also.

Despite the cumulative current account surplus, the yen's exchange rate against the dollar has been weakening since May. It dropped past the 240-to-dollar level for the first time in 10 months in July.

Among several factors that keep the yen declining, an important one is expanding deficit in the long-term capital account that became notable in the last half of 1983. The long-term capital account deficit has

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since almost offset or surpassed the current account surplus.

Especially, the recent high level of long-term outflows appears to be caused by a broadening interest rate differential between Japan and the U.S. Measured in the secondary market yield of long-maturity government bonds, the difference between the U.S. and the Japanese rates broadened to 6.03 percentage points at the end of June from 4.55 percentage points at the end of last year. The difference in the inflation-adjusted rate broadened to 3.51 percentage points at the end of May from 2.03 percentage points at the end of last year.

As U.S. interest rates are expected to continue at a high level in the future, the weakness of the yen could be prolonged and that can harm the Japanese economy in several ways. The currency's weakness, first of all, could aggravate trade friction as it is taking place in the midst of a ballooning trade surplus. Second, it also could adversely affect prices through a rise in import prices. Third, it could trigger a fall of domestic bond prices and push up interest rates, putting a brake on the economy's expansion which is just starting.

Under the circumstances, the Bank of Japan has allowed city bonds to increase leading by 39.9 per cent, or ¥2,780 billion over a year earlier for the three months from July to September. Corporate finance thus is expected to stay lax in the months to come.

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DKB ECONOMIC REPORT August 1984: Vol. 13, No. 8 18-month-old recovery in Japan gathers momentum as domestic demand picks up

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Tuesday August 28 1984

Sri Lanka's ethnic rift

WHEN Mrs Thatcher visits Sri Lanka to open the Victoria Dam in the UK contribution to the Mahaweli River diversion scheme, she, too, will doubtless be struck by the depressing contrast between the economic and political outlooks for the country.

On the economic side there is the gradual improvement brought about under President Jayawardene's more liberal administration on the political side, the all-encompassing Tamil problem. This has now acquired the same feel of intractability as the divisions of Northern Ireland, as visitors to the Test Match have been reminded.

Moral high ground

The situation is not particularly bloody at the moment and in much of the island life goes on as usual. It was only in the summer of 1983, when the majority Sinhalese inflicted uncontrolled violence upon the homes and shops of minority Tamils across the island, that one of those irreversible tragedies which create a mirror-world of irreconcilable views around minority problems everywhere: terrorists—freedom fighters; law and order—repression; political solution—self-undo and so on.

So today the bulk of the debate within and outside Sri Lanka focuses more upon the behaviour of the security forces as they try to counteract the activities of Tamil extremists than upon the underlying problem that makes their deployment necessary. The question of who has the moral high ground has become more important than the question of what the whole argument is really about.

Any hope of restoring an uneasy modus vivendi to the Sinhalese and Tamils of Sri Lanka must involve three elements. Tamil terrorism has to be more effectively suppressed at its source. The Sri Lankan security forces must become more efficient, disciplined and discriminating in dealing with Tamil and Sinhalese lawlessness. The Government in Colombo has to be prepared, because of the damage done last summer, to further relax what seems desirable or politically comfortable in devolving power to the regions.

There is a consensus among recent visitors to Sri Lanka that the Tamil terrorist movements are too sophisticated to be

spontaneous expressions of Tamil frustration. They are trained in, and supported from, the state of Tamil Nadu in India only a short boat journey away.

The Indian Prime Minister, Mr Gandhi, badly needs the support of Tamil Nadu in her forthcoming parliamentary election, and it is understandable that after the treatment meted out to Sri Lankan Tamils in the past year, she is very loath to appear to assist in any way in suppressing their justifiable grievances.

Yet it is counter-productive for her government to assist as it has ably done, in bringing Tamil politicians and the Government in Sri Lanka to the bargaining table, if these discussions are then made futile by terrorist operations supported from Indian territory.

All reports from Sri Lanka suggest that the Government's task of containing terrorism without translating it into ethnic violence. The National Security Minister, Mr Lalith Athulathududal, needs all the help he can get from outside advisers in creating a more selective and effective internal security machine.

Advisors

So far this advice has been obtained, somewhat furtively, from Israel and from a private company in the Channel Islands. There is a straightforward case for the UK sharing its experience with Sri Lanka in attempting to fight terrorism without resorting to indiscriminate reprisals.

Both these changes must be accompanied by a willingness of the Jayawardene Government to concede more of the regional autonomy that the Tamil political party, the TULF, has been demanding. A cursory examination of the ethnic and religious makeup of the different provinces of Sri Lanka shows that a separate regional autonomy is a total impossibility. But there are areas, particularly in the north of the island, where Tamils are in the overwhelming majority and where a greater devolution of authority to regional administrations would reinforce the Tamil's sense of involvement in his own government.

Frustrations of the exam system

YOUNG PEOPLE whose plans have been blighted by inadequate examination grades will feel the more frustrated this year because of criticisms of the exam system first voiced publicly in January by the Secretary for Education and Science, Sir Keith Joseph at last dispelled a widespread illusion about the 16- and 18-plus examinations which have an increasingly decisive influence on teenagers' life prospects.

The illusion was that the award of a specific exam grade testifies that the candidate possesses a specific level of skill in the subject concerned. If that were so, entrants falling short of the mark would at least have the comfort of being sure that they had been fairly found wanting by objective and constant standards. They could also be sure that by resisting the exam and improving their performance they would obtain a higher grade next time round.

Interpretation

The reality, now confirmed by the Education Secretary, is that they cannot be sure of either. Candidates in subjects which attract mass carries are not graded by objective standards of what they know and can do. Instead the grades are primarily determined by statistical rules which measure each entrant's performance only relatively against the performances of the competing candidates.

The level of understanding required to obtain a given grade can vary with subject, from one examining board to another, and over time. At 18-plus especially, the statistical boundaries separating the middle grades are so close together that variances in interpretation between people marking the papers can make the difference between a "good" B and a "poor" D.

Consistently the same level of knowledge and skill that gained entry to higher education at a desirable job 12 months ago might well have been rejected this summer, or vice versa.

Candidates just below the borderline may own their position, not to any fault of their own, but to some chance event such as another school's having recruited an inspired teacher who has boosted the performance of a whole class of entrants competing in the same exam. Moreover, from the outset, a certain proportion of

the entrants are doomed to fail. Besides being an inappropriate way to determine young people's life prospects, the present grading system—as Sir Keith has said—serves to demotivate many young teachers as well as pupils.

He therefore wishes to change the system so that the grades reflect, as far as is possible, absolute standards of what entrants know and can do. He has so far spoken of making the change only at 16-plus, although not until a few years after the present separate exams for Ordinary and Advanced Certificate of Secondary Education are merged into a single General Certificate of Secondary Education in 1988.

But if grading by objective yardsticks worked well at 16-plus, there would be good reason to make a similar change at 18-plus.

The trouble is that nobody yet knows whether it is possible to devise an adequate system of grading by absolute standards. For example, at 16-plus, a first-rate mathematician has about 130 different skills. Testing each one by his own appropriate yardstick would make for an impossibly long exam. Experts are trying to find practical solutions to such problems.

Arbitrary

But even if they succeed—when they may not—the present inconsistent and arbitrary system of grading will continue for a good many years. In the meantime, however, employers could do much to reduce the ill effects by reviewing their policies of increasingly demanding exam successes as a condition of recruitment. Ability in the examination room has no necessary relation with the ability to do skilled work.

The National Computing Centre has proved, for instance, that teenagers without any pass grades at 16-plus can become good computer programmers and operators.

What is more, as Sir Keith has also pointed out, if recruiters put less stress on exam passes, schools would be under less pressure from parents to concentrate on examination subjects and so have more time to develop other attributes employers say they want in young recruits, such as ability to work in teams.

It may be that the best part of the world economic recovery is already behind us. The international economy may now be near the peak of the current business cycle, in which case it could be not until the late 1980s that a significant acceleration in economic growth—or any decline in worldwide unemployment—can be expected.

The reasons for expecting a decline at least in the rate of growth are not unduly surprising. The leading indicators which tend to foreshadow peaks and troughs in economic cycles, have started pointing to a slowdown, not only in Britain, where the recovery is already three years old, but also in the U.S. and Germany.

But blips in the statistics would hardly be a cause for concern on their own. Economic forecasters generally acknowledge that predicting the precise timing of cyclical turning points is about the least reliable trick in their repertoire. Some of the indicators which economists use for these predictions can be extremely volatile; stock market prices and investment intentions surveys, for example, can turn out to be reflecting temporary factors like strikes or political tensions as much as underlying economic forces.

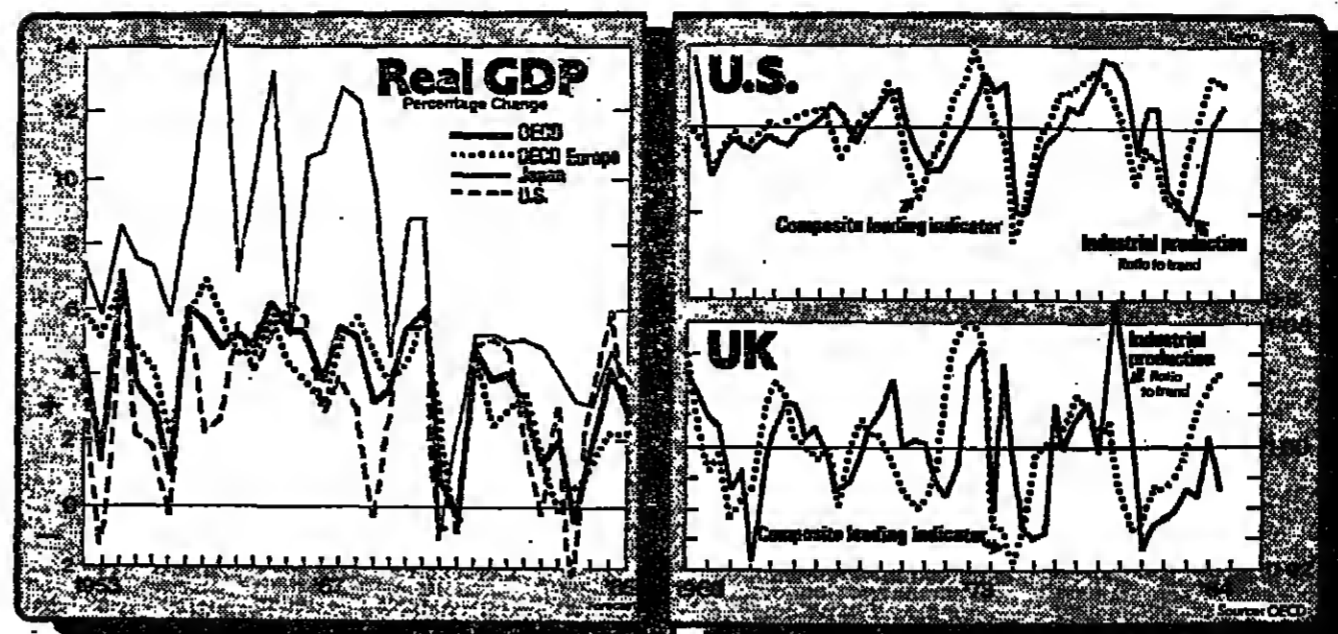
Unfortunately, there are deeper reasons for apprehensiveness. They can be divided into three groups. First, there are specific economic developments which have occurred already, but will continue to exert an influence on events in the period ahead. Then there are the natural cyclical tendencies inherent in, to greater or lesser degrees, in market economies. These are the fluctuations in output which occur because businessmen's decisions on stockpiling and investment

All these forces could soon be pushing in the same direction—downwards

are influenced not just by the present level of demand for their products, but also by their expectation of future demand, which are seldom quite accurate.

Finally, there are the policies pursued by governments and monetary authorities. During most of the post-war era, governments consciously attempted to counteract the cyclical tendencies in their economies; but since the political revolution of the late 1970s against Keynesian theories about demand management, the impact of government policies on the business cycle has been a controversial and uncertain issue.

What makes the current situation discouraging, particularly for the 31m people who are still unemployed, is the more than total economic activity, implying that the growth of exports was the main driving force behind recovery. As the table shows, this relationship between domestic and external sources of economic recovery is sharply reversed in America and Britain, the only two major countries which stimulated their domestic



Perhaps the best is already behind us

Anatole Kaletsky takes a gloomy view of the possible outlook for economic growth and argues for a revival of cyclical management policies

important of these developments has been the dominance of the U.S. economy in the current recovery. The leading role which America has taken in the growth of domestic demand in the U.S. and Europe this year, is one striking measure of the underlying strength in the two continents' economic recoveries.

Because of the strength of the dollar, much more than usual of America's domestic expansion has spilled over into overseas demand. The biggest beneficiary has been Japan (exports to the U.S. make up 23 per cent of total overseas sales for Japan; only 9 per cent for Germany). But even Europe has recovered largely because of the booming demand for its exports.

If Europe had relied entirely on home-made economic expansion, or if President Ronald Reagan had heeded Europe's moral indignation about budget deficits, the world might still be stuck in a self-righteous slump.

For Europe's firm abstinence from inflationary domestic policies, failed to promote "spontaneous" recovery. In almost all European countries domestic demand has grown more slowly than total economic activity, implying that the growth of exports was the main driving force behind recovery. As the table shows, this relationship between domestic and external sources of economic recovery is sharply reversed in America and Britain, the only two major countries which stimulated their domestic

economies with big fiscal expansions in 1983. The difference of 54 percentage points between the growth of domestic demand in the U.S. and Europe this year, is one striking measure of the underlying strength in the two continents' economic recoveries.

The warning implicit in all these statistics is that the world recovery may be quite vulnerable to a slowdown in the U.S. economy. This is where the natural cyclical tendencies come in.

These inbuilt forces presumably still exist, as they have throughout economic history, despite the forecasts or assumptions of steady growth built into many governments' budgetary plans—notably the 4 per cent growth rate assumed in the 1989 forecast recently by the Reagan Administration.

Partly as a result of these natural cyclical forces, the U.S. economy is likely to decelerate sometime in the next 18 months.

Indeed, the financial markets, along with most economists, assume that the slowdown has already begun. The OECD's July forecasts showed America's growth rate declining to an annual rate of 3 1/2 per cent in the second half of this year and 2 1/2 per cent in 1985. The recent upward revision, to nearly 3 per cent, of the first half 1984 growth figures, suggests that the U.S. economy may still be stronger than the OECD expected; but this means that any eventual fall will be pronounced.

In fact, if the OECD's predictions are realised, next year's economic slowdown could be one of the sharpest in recent history. The effect of this setback in the U.S. would be to cut 11 percentage points from the industrialised world's total growth rate.

But the OECD forecasts, which are confined to the immediate outlook, do not show the main effect of such a slowdown.

Cyclical downturns, once started, do not suddenly reverse themselves a few months later. If the world economy begins to slow next year, it is almost certain to perform even worse in 1986. For example, one leading forecasting firm, Wharton Economics, which broadly agrees with the OECD's 1985 figures, predicts a further slowdown to only 1.1 per cent by 1986 in the industrialised countries as a whole, 1 per cent in Europe, 0.6 per cent in the U.S. and 2.5 per cent even in Japan.

That kind of decline, with its concomitant lengthening of the time queues, can be described quite unequivocally as a new recession—and a severe one at that.

The fact that there may be another recession in 1985-86 is due largely to the third element in the present economic conjuncture: government policy. Although some sort of cyclical downturn in the U.S. seems unavoidable at some point in the next year or so, it need not have implied recession, or even discomfort, for the world economy as a whole.

In theory, the U.S. economy could have been allowed to decelerate quite gently, from a peak level of growth, rather lower than the 10.1 per cent rate registered in the first quarter of this year. And irrespective of whether America managed to achieve a controlled "soft landing," the impact of the U.S. slowdown on the rest of the world could undoubtedly have been offset by an acceleration of growth in other countries. In practice, however, both

of these possibilities now appear sufficiently remote to make it legitimate to use the past conditional tense.

In the U.S., the Reagan Administration continued to pump demand into the economy with ever-larger budget deficits after the usual "budget priming effect" had been accomplished. But by late 1983, which is the earliest date that a substantial tax increase to reduce these deficits could conceivably come into force, it will almost certainly be too late to reduce the budget deficit for the duration of the current economic cycle.

For a tax increase late in 1985 would further weaken the economy when—according to this argument—it was already sliding downwards under its own weight. Without a tax increase, however, the natural tendency for investment to weaken and for consumers to spend instead of saving during the later stages of the economic cycle, would be exacerbated by high interest rates, the strong dollar and growing worries about inflation. Thus, however much the President would like to prevent the U.S. economy from slipping into a "recession" growth rate of 3 or 4 per cent, Mr Reagan may be unable to do anything to sustain this kind of growth.

In Europe and Japan, by contrast there is scope to stimulate further recovery. European governments certainly have no inclination deliberately to take over the locomotive role which America has been performing so effectively.

If current policies and trends persist, domestic demand will be growing more slowly than total national output in every major country outside America in 1985, as the table shows. In other words, Europe and Japan may still be seeking export-led

Europe and Japan seem to be synchronising economic cycles with the U.S.

growth from America next year, even as the U.S. economy moves towards recession. Even by 1985, after four years of continuous austerity European governments will probably remain unwilling to drive their economies forward with a surge in domestic consumer spending, stimulated by tax cuts.

From an international standpoint the most unfortunate corollary is that the economic cycles in Europe and Japan seem to be becoming fully synchronised with the American cycle. Were Europe willing now to pursue a more independent policy, economic fluctuations in the two major economic blocs might cancel out—instead of reinforcing—one another. But this kind of reasoning is totally alien to the thinking of economic policy makers today.

Rather than "fine-tuning" macro-economic policies to the control of cycles, politicians today prefer to engrave their policies in granite—be they President Reagan's "supply side" tax cuts, Sir Thatcher's Medium Term Financial Strategy or the "budgetary conditions" of Germany and Japan.

HOW THE RECOVERIES COMPARE

	% Growth of:	1983	1984	1985
U.S.	GNP	3.4	6	2 1/2
	Domestic demand	4.6	7 1/2	3
Japan	GNP	3.0	4 1/2	3 1/2
	Domestic demand	1.5	3 1/2	3 1/2
W. Germany	GNP	1.3	3	2 1/2
	Domestic demand	1.9	2 1/2	1 1/2
UK	GNP	3.1	2 1/2	2 1/2
	Domestic demand	4.7	3	2 1/2
OECD Europe	GNP	1.3	2 1/2	2 1/2
	Domestic demand	1.9	2 1/2	2

Source: OECD Economic Outlook

Cadbury takeover talk

With this year likely to be a record one for takeovers in Britain, it is interesting to see Peter Paul, a large confectionery company, being taken over by Cadbury saying at a meeting last week, in off-the-cuff remarks, that he did not think takeovers, per se, were a good thing. His statement appears to have struck sympathetic chords in the business community.

Asked to elaborate on what he meant, Sir Adrian told me that he was answering a question at a press conference about whether he feared being taken over or whether he planned takeovers himself. He said that to answer to any takeover was a jazy Public Relations defence but improving earnings per share.

"After all if you are improving your earnings per share each year by increasing efficiency why should the shareholders want some other management?"

As for taking over companies he said: "I am hardly likely to announce it through the columns of national newspapers first am I?"

His basic point about takeovers, though, was that there had to be a real commercial logic. Big often meant worse in his opinion.

"There are always human problems when you expand in size. You have to make sure there are enough people around to round the show."

"I suppose we are talking about the old sixties buzz word, synergy. Where you can make two plus two make more than four, you are in business," he went on.

Sir Adrian justifies a recent Cadbury Schweppes takeover. In the U.S. Cadbury took over Peter Paul, a large confectionery company with a well-established distribution network in the U.S. whereas Cadbury had virtually none.

"On the other hand," as Sir Adrian puts it, "we were able to help them in the same way in Canada." He believed, then, in a meshing of companies where there was some area where one company was weak.

Men and Matters

He also thought there was a logic in the single product company getting together with others like the one Adrian Cadbury saying at a meeting last week, in off-the-cuff remarks, that he did not think takeovers, per se, were a good thing.

In agreement

Possibly surprisingly Neil Shaw at Tate and Lyle also feels that takeovers for their own sake are not necessarily a good idea.

"Just taking over companies for size is like saying growth for itself is a good thing," he said.

What then did he feel was the logic of his own company's attempt to buy Brooke Bond, a confectionery company with an interest on the tea side particularly. Given our experience in sugar, with growing, packaging and distribution and our involvement in the Third World generally, there is a lot we can do on the tea side. With other areas of the company we perhaps do not have the experience."

Timber is becoming a glamour area but we do not have the management range to enter this area. There would be no point in us attempting to go into a field where we do not have the necessary expertise.

"You would sell off this part of Brooke Bond then?" I asked.

"I imagine, this and the butchers' shops, we don't know about butchering."

Feels strongly

Christopher Hogg, the chairman at Courtaulds was even more emphatic that takeovers should not be entered into lightly. "I feel very strongly that you should not buy other companies unless you are sure 2 and 2 are going to add to more than four. The commercial logic might look alright, but then the financial and management logic does not

square," he added, "I am before my day, Courtaulds, as you know, bought left right and centre everything in sight. I can tell you that there are an enormous number of headaches in stretching your management to run concerns they do not know anything about." Owen Green at BTR seems to manage and there are American conglomerates like United Technologies, or Jimmy Hanson's group. But whether these sprawling conglomerates only last as long as the entrepreneurs who set them up I don't know.

Often overlooked

David Donne, Chairman of Dalgety feels that the institutional shareholders are often overlooked. "You have got a situation now where the institutions are important shareholders in any major company. Generally they like to stay with the management they know."

"Where a management is underperforming in one's particular sector, one knows about it. But one has to restrain oneself from plunging in for the quick turnaround if there is to be no lasting benefit," he said.

"Then again," he said, "integrating vertically because you think you are going to save money does not always work. Verticality killed the British textiles industry. Well the carpet industry. In my view carpet manufacturers paid too much for raw materials because they came from the same group. There was no element of competition in purchasing."

Observer

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Artists Impression
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Where people like to work

Letters to the Editor

Labour costs and world markets

From Mr J. Hale
Sir—Samuel Brittan writes: "ensuring that the country is not priced out of world markets is child's play" (Lombard August 20). This is clearly true if the nominal exchange rate always shifts to offset changes in relative cost or price inflation thus preventing any loss of international competitiveness. Yet such stability in the real exchange rate is rarely observed empirically. Many other factors determine changes to nominal exchange rates...

weighted world may still be of the order of 40 per cent. (Note that none of these calculations is based on any arbitrary starting date for PPP "equilibrium", but instead make use of a detailed OECD survey on international price comparisons updated as necessary by price changes since 1975). Nominal exchange rate depreciation has undoubtedly eased the loss of competitiveness in the most recent period, but as the reverse process helped exacerbate the problem in the 1978-81 period, but the Employment Secretary is right to worry about a continuing rise in UK labour costs when German costs are constant. The same real exchange rate calculations for the Deutschemark show that it is already undervalued "relative to sterling by about 60 per cent."



"I got the idea from an article suggesting cars be sold in supermarkets."

Common Market in cars

From the President, Motor Agents Association
Sir—Editorials in the Financial Times are seldom anything but well-informed and cogently argued. I regret that cannot be said of "Common Market in cars" which appeared on August 21.

new cars on the one hand, and a servicing organisation which would also distribute spare parts on the other. As a further argument in support of the franchised system, it points out that before a new vehicle is delivered to the consumer, it has to undergo a technical inspection by the authorised supplying dealer specially equipped to do so.

Profitability of air routes

From Mr R. Hodges
Sir—Mr Bishop (August 21) incorrectly states that British Midland Airways allegedly has a better profit record on certain air routes than British Airways, the longer term security of these routes and the jobs that go with them should be entrusted to BMA.

on various air routes at present British Airways, eg Birmingham-Paris. Is it appropriate for such a transfer to be made on the basis of past profitability where assumptions may not in fact be comparable? BPP equilibria (even in the relatively long run) as the academic debate on "overshooting" has now recognised. Those framing monetary policy should recognise it also.

There is little doubt from this evidence that real exchange rates are far from stable at their PPP equilibria (even in the relatively long run) as the academic debate on "overshooting" has now recognised. Those framing monetary policy should recognise it also.

Simon & Coates, 1, London Wall Buildings, EC2.

World trade in textiles

From the President, British Textile Confederation, the Chairman, British Clothing Industry Association and the President, Knitting Industries' Federation
Sir—Your leader on textiles (August 15) overlooks some of the reasons why the GATT multi-fibre arrangement has remained in force, and why it will be renewed in 1986.

developing countries—their guaranteed access under the MFA to the markets of the industrialised countries has allowed them to expand their textile trade which otherwise would have gone to the non-industrialised countries. Within the MFA, for example, the ASEAN countries have increased their textile and clothing exports to the UK from £36m in 1978 to £76m in 1983.

BA's regional air services

From the Marketing Manager, UK Domestic Market Centre, British Airways
Sir, Michael Bishop of British Midland Airways suggests (August 21) that British Airways is willing to operate regional air services "through cross subsidy or at a minimal return."

reducing regional air services, we firmly intend to expand as recession eases. Our customers need not fear for the continued operation and growth of our regional centres. We are there to stay, and to improve the service we offer them—profitably, of course. We are confident our future shareholders will endorse this policy.

A further point is the lack of reciprocity to the growing market access given by us under the MFA. The recent GATT decision which trade highlighted the massive protection of their home markets by most developing countries and NICs. Complete dismantling of our own barriers is not acceptable for so long as genuine equality of opportunity in trade is impossible with more than a handful of them.

The Royal Dockyards campaign

From Sir John Mallabar
Sir—On August 2 you printed a letter from Mr Miller at Devonport Dockyard expressing his dismay at the conclusions of the Commons Public Accounts Committee. I have since obtained a copy of the report, from which I will quote.

Argument first arose as to whether our target date was practicable, and it was suggested that another year would be required. If you do not wish to be forced along a line to which you object, an obvious course is to adopt it to use delaying tactics, set up committees to consider "read-vise" until opposition is worn down. This would seem to have been the road which was taken.

will increase this depressing trend. Future negotiations for MFA 4 should at the very least exempt the poorest countries from all restrictions both within the MFA and bilateral agreements. This would make a valuable contribution to these countries' overall development and would be an important practical expression of the international community's commitment to Third World industrialisation.

Money due to beneficiaries
From M. P. Richer
Sir—No insurance company recognises an unqualified liability to pay interest on money due to beneficiaries for every day it sits on it. Any payment, if at all, is ex gratia and entirely at the company's discretion.

Even when ex gratia payment is made there is, more often than not, a long period during which interest is not paid. Interest rates vary widely and, what is more, tax at 30 per cent is deducted at source. How many beneficiaries (often elderly widows) realise that this tax can often be recovered?

Terminologically inexact
From Mr H. Bloomer
Sir—Discredit where discredit is due! Mr Ashworth-Lord's statement (August 22) that it was a Conservative Government which cancelled TSR-2 is terminologically

POLITICS TODAY

For Republican, read Tory

By Malcolm Rutherford in New Orleans



President Reagan, accepting the Republican nomination for a second term, in Dallas last week

THERE ARE two main differences between President Reagan and Mrs Thatcher as politicians. One is that Mr Reagan is remarkably popular among a majority of Americans, even among those who will not vote for him.

for Clem Attlee. Hugh Gaitskell and possibly even James Callaghan. It was only Michael Foot and his younger counterpart, Neil Kinnock, who took Labour out of the mainstream, as the Tories say today.

There is a note of defection in the air, too, though not to a third party. Some relatively obscure state politicians have already switched straight from Democrat to Republican. President Reagan is appealing to other closet supporters to come over to the party of opportunity.

One who probably will not be Mrs Jeane Kirkpatrick, the US Ambassador to the United Nations. Mrs Kirkpatrick is a Democrat. She says that in domestic politics she is still a welfare liberal. But she can represent a Republican administration on foreign policy because she thinks it is the sole legacy of the post-war aims of President Truman and General Marshall.

Dr Owen will not like the comparison, but his own firm defence of what Labour foreign policy used to be has a lot in common with the way Mrs Kirkpatrick is behaving now. She has no interest in defecting yet, but if ever she wanted to be in line for the Republican succession, she could do it.

To revert, however, to the Republicans and the Tories. The similarities in the programmes are uncanny. They have the same heroes, principles.

At the Republican Convention in Dallas last week, RDR was proclaimed as an American Democrat. It was not, even J. F. Kennedy, The Democrats, it was said, went astray only under Carter and Walter Mondale.

It sounded like the Tories pouring out their admiration for Mrs Thatcher as politicians. They have the same heroes, principles.

Here, government intervention is totally in order. Indeed, it seems to be an Anglo-American conservative common creed that, without more public investment in research and development, economic growth will come to a standstill. The Tories and Republicans have taken over as the promoters of high tech, even Mrs Thatcher has not been as public about it as she might have been. Labour and the Democratic Party are condemned alike for seeking to protect old jobs and an old way of life. The conservatives in both countries have become the radicals, while Labour and the Democrats have become the conservatives.

There is a final parallel between Mrs Thatcher's Tories and President Reagan's Republicans. Both parties are now involved in the struggle for the eventual succession, and it concerns more than personalities. The concept of "wets and dries" does not exist in America. Instead, Republicans talk about themselves as conservatives, moderates, or liberals. But the divisions are much the same.

Mrs Thatcher has not quite eliminated the wets in the Tory tradition, as Mr Francis Pym demonstrated in his recent book. Nor have the moderates been entirely extinguished in the Republican Party.

Vice President Bush has played the same role to Mr Reagan as the then Mr Whitelaw did to Mrs Thatcher in her first term: a moderate who has been utterly loyal to a right-wing chief. He may have kept the liberal option open.

Mr John Biffen remarked after the last British general election that it was no longer a battle between wet and dry, but between the radicals in the party and the conservatives. That is probably the question for the Republicans next time. There is a group of young hawks who would like to push the party ever rightwards, using the methods such as control of the manifesto—by which the Far Left tried to take over the Labour Party. But it is not yet certain that Mr Reagan will encourage them.

He might even go for a major arms treaty with the Soviet Union, which would upset them a great deal.

The President and Mrs Thatcher could turn out to be consolidators in the end.

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FINANCIAL TIMES

Tuesday August 28 1984



Terry Byland on Wall Street Turbulent time for airlines

STOCKS of U.S. domestic airline companies have the unenviable distinction of having underperformed against a rocketing equity market over three exciting weeks on Wall Street.

After a brief surge which lifted some to within hailing distance of their 52 week highs, prices turned back, and UAL (United Airlines), AA (American Airlines) and TWA are now below their early-August quotations.

The upset was caused first by the fear, and then the reality, of a return to fare-cutting on domestic routes, which plagued the industry and its profits a few years ago.

The stock market's worries came in a head whir. People Express, the latest and sharpest of the price-cutters, announced that it was moving in on the lucrative East Coast to Chicago routes.

The latest statistics from the Civil Aviation Board (CAB) show that AA had 34.3 per cent of the Chicago to New York traffic, and 38.3 per cent of the traffic on the Boston to Chicago route, which is the second in importance of the group.

Banks see progress in talks on Mexican debt

BY MARGARET HUGHES IN LONDON

MEXICO AND its 13-member bank advisory committee made "substantial" progress in negotiations over the weekend towards a multi-year rescheduling of the country's public sector debt.

Detailed proposals of the terms and conditions of the rescheduling are expected to be circulated to Mexico's 500 creditor banks early next month, but no date has yet been set for reconvening the talks between Mexico and the creditor banks.

A multi-year rescheduling of Mexico's debt would represent a major breakthrough towards achieving a solution to the repayment problems of Latin American countries, which collectively owe \$350bn to their foreign creditors.

Mexico had earlier proposed a 15-year rescheduling of all public sector debt falling due between the end of this year and 1990. This would

amount to \$46bn, more than half Mexico's total foreign debt of \$87bn. Mexico also wanted to include within the package some of the debt which has already been rescheduled under earlier agreements with the creditor banks as well as the \$5bn commercial bank loan agreed last year.

In addition, Mexico has asked for a commitment from the banks to lend new funds if there is a significant increase in interest rates.

Mexico has been promised better rescheduling terms by Mr Jacques de Larosiere, managing director of the International Monetary Fund, in return for its progress in adjusting its economy, a promise which was supported by Western governments at this year's London summit.

The commercial banks, however, have been reluctant to agree a rescheduling which would extend beyond the term of office of President Miguel de la Madrid, which expires

in 1988 or beyond the present IMF programme which ends next year. Mexico has said it sees no need for a further IMF programme but the Fund has been reluctant to assume responsibility for monitoring a country's economic performance where it has no programme in place.

It is not yet clear how Mexico and its creditor banks have reconciled this problem. One possibility is that Mexico would submit reports on its economic performance for authentication by the IMF. This would not involve direct monitoring by the IMF.

In addition to a multi-year restructuring, Mexico is seeking a reduction in interest rates below the present margins which average 14 per cent over Eurodollar rates. It also wants banks to drop their option to base their interest rates on the more expensive U.S. prime rate, and to drop their normal rescheduling fee, which could be as much as \$480m.

International credits, Page 13

Belgium and UK seek air fares cut

By two Dawsey in Brussels

TALKS between British and Belgian transport ministry officials are expected to begin this week, aimed at introducing cheap air fares between the two countries.

The negotiations follow the agreement signed in June between Britain and the Netherlands, which ushered in a £49 (\$64) return fare on London-Amsterdam flights, with extensive reciprocal liberalisation of rights for the two countries' airlines.

Belgium is believed to favour a similar package, not least to counter the effects of cheap price fares from the UK to its near neighbour.

Herr Karl-Heinz Neumeister, secretary-general of the Association of European Airlines, disclosed Britain's interest in negotiating a cheap fares deal. He said the UK had asked for a meeting with Belgian transport officials "by the end of the week."

Herr Neumeister, whose 20-airline association supports the drive for cheap fares, said he believed any agreement reached could be implemented well before next January.

"It took only a week for the British Government and the Netherlands to implement the £49 return fare, and I do not expect it will take the Belgian Government any longer to agree," he said.

UK Transport Ministry officials could not formally confirm that a request for talks had been made. However, it is understood that Mr Nicholas Ridley, UK Transport Minister, has indicated a wish to press ahead with fare and other reforms after the agreement with the Netherlands.

Michael Dunne, Aerospace Correspondent in London, writes: Concord is now paying its way in the British Airways' fleet and is contributing to the airline's turnaround with steady profits, according to Captain Brian Walpole, BA's General Manager, Concord. No figure is given, but it is believed to be several million pounds a year.

BA has six super-jet Concordes in service, and a seventh is being brought up to full flying standard, to join the fleet next year.

Aerospace survey, Section III

THE LEX COLUMN The clock stops on deregulation

Bankers who fled quietly in the night from U.S. frontier towns a century ago helped to establish a suspicion of banking which has been perceptible in the U.S. almost ever since. It was heavily buttressed by the bank collapses of the Depression era and the Glass-Steagall legislation of 1933 has been its lasting monument.

Within a few weeks of the rescue of Continental Illinois, the U.S. financial system is confronted with an impending liquidity crisis in another institution with assets more or less the same size, as it happens, as those of the crippled Chicago bank. The problems of Financial Corporation of America (FCA) are rather different from those of Continental Illinois and could still prove less than disastrous with a bit of help from conditions in the U.S. money market.

The awesome scale of FCA's calculated gamble on its mismanagement of long-term fixed-rate assets and short-term funding has been well aired; but the gravity of its immediate liquidity problem may still have been underestimated.

Having turned over \$10.9bn of short-term liabilities just last month, it could now be faced with retaining as much as \$500m of its liabilities every business day - not to mention a heavy burden of fresh property loans to which it was committed at the end of June. Unlike Continental Illinois, FCA is not solely reliant on

the wholesale money market. But Wall Street is acutely nervous of a serious run on its retail deposits and the company's access to assistance from the Federal Home Loan Bank - which in theory could run to several billion dollars on top of perhaps the \$2bn already borrowed - seems vulnerable to mounting criticism from the rest of the S & L industry.

All that said, FCA is one of the most celebrated products of nearly 10 years of deregulation. For nearly half a century, Regulation Q imposed interest-rate ceilings imposed by the Glass-Steagall Act. In the wake of its removal and because of competitive rates and aggressive marketing of "jumbo" deposits and wholesale funds - neither is available to it under the current regime - FCA has made itself the largest S & L holding company in the U.S. within the space of a few years.

It has also, given a bad press and a savage mauling from the SEC, made itself into the biggest headache currently afflicting the U.S. money markets. And if this should turn out to be the first symptom of another financial debacle on the scale of Continental Illinois, the argument for significant changes in the regulatory environment will be pressing.

The implication of such specific adjustments as these for the wider regulatory environment is harder to predict. The fundamental changes wrought by deregulation, including a whole new market devoted to centralised management of cash assets, are surely irreversible, as in the U.S. airline industry, where they have brought about huge benefits. To maintain the safety record of the financial sector, however, it might now be thought necessary at the very least to review the brief of the various Federal insurance agencies and perhaps to demand of them a more active watchdog role.

Likely trigger

A much heavier involvement for the Home Loan Bank could presumably be made conditional upon sweeping changes in FCA's management and operations. This now appears the most likely trigger for any near-term moves on the regulatory front. It is conspicuous, for example, that some features of FCA's rapid expansion - such as its purchase and recent sale of shares in American Express - have only been possible because it is a state-chartered S & L rather than a Federal-chartered company like most of its competitors. Again, tighter restrictions on the Federal insurance cover available on S & L deposits may have curtailed FCA's access to pension funds and this could be another area for scrutiny.

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Ford to open third U.S. outlet to sell luxury European imports

BY KENNETH GOODING, MOTOR INDUSTRY CORRESPONDENT, IN DETROIT

FORD is to build a third car franchise in the U.S. which will sell high-priced models imported from Europe.

The company revealed some time ago that it would begin sales this autumn of a version of the German-built Sierra XR4i to be sold as a "Mekur" in the U.S.

Mr Donald Petersen, Ford's president, made clear yesterday that this was the first step to establish a new Mekur franchise in the U.S. separate from the Ford and the Lincoln-Mercury operations.

"The introduction of the Mekur was not something we did lightly, but the logical choice would be a

version of the Granada replacement due early next year in Europe and by all accounts somewhat similar in style to the Sierra. It is also known that Ford has been preparing the new Granada - which will be built only in West Germany - to pass technical tests in the U.S.

The American Sierra-Mekur will be powered by a turbocharged 2.3 litre engine, made in Brazil, rather than a European unit.

Dealers who have applied for the new franchise have been told the retail price will be about \$16,000 to \$17,000 when the car goes on sale in the autumn. Sales might reach 60,000 to 100,000 a year.

and we intend there should be continuity. We build cars of real merit in Europe, with distinctive differences from our American products. With relatively low investment, we can bring them into the U.S. as a new line," he said.

All the cars would be "at the lower end of the luxury price range, and that limits volume," Mr Petersen said, "but we look at the volumes the various European companies sell in the U.S. and that suggests to us we have a similar opportunity."

Mr Petersen would not be drawn about what might follow the Sierra, but the logical choice would be a

Jaguar demand creates jobs

BY DOMINIC LAWSON IN LONDON

JAGUAR, the British luxury car manufacturer, is creating 500 jobs in an effort to meet a rapid increase in demand, particularly from the U.S. and West Germany.

West German demand for the cars so far this year is 65 per cent up on the same period in 1983. A total of 1,100 Jaguars has been sold there in the first seven months of the year, compared with 1,220 in the whole of last year.

In the U.S. more than 10,200 cars have been sold so far this year, an increase of 16 per cent over the comparable period of 1983. Jaguar has not cut its U.S. selling price in an attempt to exploit the weakness in the sterling-dollar exchange rate, so the company feels confident that it is creating the new jobs on a sound long-term basis.

Mr John Egan, Jaguar's chief executive, said yesterday that "by increasing production, we can take advantage of the overwhelming sales demand in the U.S. and Germany."

Jaguar made pre-tax profits of £55m (\$71.9m) in 1983, a further £43m in the first six months of this year. Shares in the former part of state-owned British Leyland, which were offered to private investors earlier this month, were eight times oversubscribed. The share price ended the week on the London Stock Exchange at 171p, above the 165p at which they were sold by the Government.

Last year the company sold 28,000 cars, but it expects to sell about 32,000 in 1984.

The company pointed out yesterday that it did not believe in taking on new staff unless it could give them secure employment for at least two to three years. Mr Egan

added: "The increase in the workforce has been carefully assessed to maintain our policies of offering secure long-term employment and continuing to increase our productivity."

In 1980 Jaguar turned out 14 cars a worker a year. This year it has been producing 3.5 cars a worker a year, and next year it projects a further increase to 3.7, even after the increase in the workforce.

Recruitment will start immediately for the jobs, of which 320 are to be at the Browns Lane assembly plant in Coventry, the Midlands. Another 160 men are to be taken on at the Radford engine and axle plant, also in Coventry. The remaining 50 are to be located at the Castle Bromwich body assembly and paint plant in Birmingham, also in the Midlands.

add: "The increase in the workforce has been carefully assessed to maintain our policies of offering secure long-term employment and continuing to increase our productivity."

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Thais plan refinery expansion

By Peter Bruce in London

THE THAI Government has launched an international advertising campaign in an effort to encourage new bids to double capacity at the Thai Oil Refining Company (TORC) refinery near Bangkok. The bids could reach \$500m.

TORC, which is 49 per cent owned by the Government's Petroleum Authority, first awarded in April 1982 a \$452m contract to expand capacity at the refinery from 65,000 to 110,000 barrels a day to a consortium led by British-Davy McKee, and two French partners, Profrance and Technip but withdrew it last month after months of arguing over financing.

The contract was the biggest ever awarded to a British company in Thailand. But while TORC's advertisements insist that "the contractor will also be required to arrange the finance" it is highly unlikely that the Thais, in return, will be prepared to guarantee much, if any, of the loan capital raised.

Worried about the state of world oil markets, and hence the project's visibility, Barclays International and Société Générale of France, the Davy consortium's original bankers, began to apply pressure last year for some form of guarantee from the Thais. This culminated in the collapse of talks between the Thais and the bankers and contractors in London last November.

Mr Oh Vassaratna, the Thai Industry Minister, threatened to call for new tenders but the British and French governments stepped in with offers of grants, soft loans and buyer credits. Barclays International and Société Générale took a back seat after the contractors brought Morgan Grenfell, London merchant bankers, and Banque Indosuez, into "the negotiations."

TORC is now looking for responses to the bidding by September 1, and project managers, U.S.-owned Foster Wheeler, who are running the project through their UK subsidiary, believe they will be ready to put together a shortlist of approved bidders in about two months.

The contract, all being well, should be re-awarded in the second half of next year. Having already spent more than three years with the project, Davy, Profrance and Technip are thought likely to try again.

Zanussi pact sought

Continued from Page 1

alternatives would aim at the same objectives as before.

"We have asked for a certain sacrifice and we have to stick to that, but there are possibilities to arrange the sacrifice in different ways."

The group of 80 Italian banks which hold the bulk of Zanussi's total gross debt of L1,046bn (\$582m) have agreed to reschedule their loans over the next seven years and to reduce interest rates, a sacrifice of about £300bn.

Mr Ribolin agreed that the deal was still uncertain. "If we don't get agreement I don't know what will happen," he said.

Amid the continuing uncertainty the Electrolux leadership moved at the weekend to shore up waning business confidence in Zanussi by signing a conditional agreement

with the Zanussi family and the Italian consortium led by Mediobanca for its acquisition of a 49 per cent stake in Zanussi.

The agreement is still conditional on other parties, chiefly the foreign banks and the regional authorities agreeing to the final terms of the rescue.

Under the deal signed at the weekend, Electrolux would pay about \$1.5bn (\$18m) for the existing equity, recently written down - to the Zanussi family and the other major shareholder, Voest Alpine of Austria.

Some L100bn would be injected in new equity - 47 per cent by Electrolux and the remainder by the Mediobanca consortium which includes Fiat and other Italian investors.

Unitary tax move resisted in California

Continued from Page 1

The intent of the legislation was not to benefit one group of companies over another, she said, but to make California more attractive to multinationals, and to remove the threat of retaliation in foreign countries.

"Foreign companies and governments, especially in Britain and Japan, have actively campaigned for a change in the California tax system," Mr George Deukmejian, the state governor, announced in May proposals to amend the tax code which would significantly modify unitary tax. The Governor forged his friends closer to home, however, claim the Silicon Valley companies.

"I know of no other instance where foreign companies are treated better by local governments than home-grown firms," Dr Moore said. The Bills would "compromise our ability to compete, to grow and to employ more Californians."

"Unitary tax will become another negative factor against California if the proposed legislation passes," Mr Michael Maybeck, Intel spokesman, said. "I am not suggesting that Intel or any of the larger companies will move out of the state, but many companies - tomorrow's Intels - will have to look closely at whether it is worth staying."

Company representatives admitted to being "shunned" by the swift passage by the State Senate this month of two Bills dealing with unitary tax, after six years of lobbying efforts had failed to achieve as much.

World Weather

Location	Temp	Wind	Cloud	Temp	Wind	Cloud	Temp	Wind	Cloud
Agaña	23	7	7	Thames	15	11	Windsor	15	11
Algeria	23	7	7	London	15	11	Windsor	15	11
Amsterdam	19	8	8	London	15	11	Windsor	15	11
Antwerp	19	8	8	London	15	11	Windsor	15	11
Bombay	24	9	9	London	15	11	Windsor	15	11
Buenos Aires	22	7	7	London	15	11	Windsor	15	11
Calcutta	25	7	7	London	15	11	Windsor	15	11
Cardiff	15	11	11	London	15	11	Windsor	15	11
Chennai	25	7	7	London	15	11	Windsor	15	11
Cairo	28	8	8	London	15	11	Windsor	15	11
Colombo	25	7	7	London	15	11	Windsor	15	11
Copenhagen	15	11	11	London	15	11	Windsor	15	11
Dublin	15	11	11	London	15	11	Windsor	15	11
Edinburgh	15	11	11	London	15	11	Windsor	15	11
Hankow	25	7	7	London	15	11	Windsor	15	11
Hong Kong	25	7	7	London	15	11	Windsor	15	11
London	15	11	11	London	15	11	Windsor	15	11
Lyons	15	11	11	London	15	11	Windsor	15	11
Madras	25	7	7	London	15	11	Windsor	15	11
Manila	25	7	7	London	15	11	Windsor	15	11
Medan	25	7	7	London	15	11	Windsor	15	11
Meerut	25	7	7	London	15	11	Windsor	15	11
Mumbai	25	7	7	London	15	11	Windsor	15	11
Nairobi	25	7	7	London	15	11	Windsor	15	11
Paris	15	11	11	London	15	11	Windsor	15	11
Rangoon	25	7	7	London	15	11	Windsor	15	11
Reykjavik	15	11	11	London	15	11	Windsor	15	11
Rome	15	11	11	London	15	11	Windsor	15	11
Singapore	25	7	7	London	15	11	Windsor	15	11
Sourabaya	25	7	7	London	15	11	Windsor	15	11
Taipei	25	7	7	London	15	11	Windsor	15	11
Tientsin	25	7	7	London	15	11	Windsor	15	11
Yokohama	25	7	7	London	15	11	Windsor	15	11



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Optical Fibres make light of communication in more ways than one. As a company they are dedicated to the volume production of high quality, low loss optical fibres for all communications applications.

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SECTION II - COMPANIES AND MARKETS
FINANCIAL TIMES

Tuesday August 28 1984

Ring... King & Co Industrial and Commercial Property Tel: 01-236 3000 Telex: 895485

DOUGLAS CONSTRUCTION Building the way ahead

HONG KONG BORROWING

First local floater soon for Mass Transit Railway

BY DAVID DODWELL IN HONG KONG

WITHIN the coming month, Hong Kong's Mass Transit Railway Corporation (MTRC) will unveil details of a HK\$300m (\$43.2m) floating-rate note being arranged by Morgan Guaranty and Manufacturers Hanover. It will be yet another "first" for the territory's biggest borrower.

"We have pioneered new kinds of borrowing and have been aggressive borrowers," Mr Lau Wah Sun, the MTRC's outgoing finance director, said. "We are proud of this - not because we like owing people money, but because it means we've been able to borrow more cheaply."

During the past year, the MTRC has mounted Hong Kong's first

Major MTRC loans concluded since August 1983

Table with columns: Bank, Amount, Maturity, Coupon, Price, Lead Manager, Offer yield. Includes entries for Banque Paribas, Indosuez Asia, Midland/Crocker, etc.

Extended from original HK\$300 m loan

bond issue and the territory's first U.S. dollar-denominated commercial rate note as part of a borrowing programme which has garnered commitments amounting to almost HK\$30bn. Gross borrowings for the nine-year-old corporation add up to HK\$15.5bn, and are likely to peak in 1986 at about HK\$22bn.

The corporation, wholly owned by the Hong Kong Government,

which has injected equity amounting to about HK\$5bn, is not without its detractors, however. Many feel it was rash to go ahead with its third railway line - the Island Line, due to be completed in the middle of next year - once the local property market collapsed in 1982.

They have argued that a corporation with relatively fixed future income, and fixed overheads, will be unable to repay the debts incurred and will be forced to turn to the Government for fresh funding. It will be the Hong Kong taxpayer who will ultimately pick up the bill, they say.

In 1983, the MTRC made a loss before extraordinary items of HK\$35m due entirely to interest and finance charges of HK\$78m on its borrowings. Losses are expected to mount, peaking around 1986.

It has additionally been hit by foreign exchange translation costs amounting to almost HK\$900m. Losses so far have eroded the Hong Kong Government's investment to about HK\$3bn. Yet the MTRC maintains the highest possible credit rating among international lenders, who no longer insist on government guarantees, and are now offering loans at between 1/4 and 1/2 a percentage point above the London Interbank Offered Rate (Libor). This compares with margins of 2 1/2 points when the corporation first turned to the international capital markets.

One prominent banker in Hong Kong explained: "If you look only at the current cash-flow, then obviously it can't pay its debts. But banks are looking to the future, and the fact that there will be no other means of transport in the territory that can overtake it. They also have the implicit understanding that the Hong Kong Government is standing behind it, and the Government is, after all, basically engaged."

Changes in U.S. bond rules stir uncertainty

BY MAGGIE URRY IN LONDON

YET AGAIN the Eurodollar bond market has cause to mutter darkly about the U.S. Treasury, its new regulations covering U.S. issuers' bonds sold overseas, published last Monday, only increased the uncertainty.

The regulations seem to say that whoever pays the interest outside the U.S. on a corporate bearer bond must have written proof that the recipient is not a U.S. person or else it will have to levy a 20 per cent "back-up" withholding tax. That would be enough to stop investors buying the bonds.

Dealers are anxious that the Treasury sort it all out before recent deals for Texaco, Mellon Bank and Beatrice are closed. Otherwise they might have to be cancelled. The unkindly traders say that would not be a bad thing in Beatrice's case, as the price suffered losses, as the price slid to a 5 point discount.

New issue managers will not risk bringing a fixed rate issue for a U.S.

BHF Bank bond average table with columns: August 27, Previous, High, Low. Values: 99.855, 99.540, 100.009, 98.056.

Friday's \$350m issue for property company Trizec looked a little aggressive. The borrower has a U.S. dollar with a 16 per cent coupon which is traded at 102 1/2, so a 13 per cent yield looks low. But the domestic Canadian bond market has rallied well this summer and yields there are lower than in the U.S.

In the Eurodollar market, last week's issue from Secom is already trading at 102 1/2. In D-Mark, the Rhythm Watch bond with warrants has shot up to 104, while the Nitro Roseki convertible is just below par. And in the Swiss franc market, recent convertible private placements have all been fixed with lower-than-indicated coupons.

The continental markets are taking heart from the slight weakening of the dollar, and the more stable New York bond market. D-Mark bonds gained around 1/4 point over the week - further encouraged by the lightness of the current new issue calendar. Swiss franc bonds added around 1/4 point.

Mexico talks provide cause for optimism

BY MARGARET HUGHES IN LONDON

PROGRESS TOWARD a multi-year rescheduling agreement between Mexico and its creditor banks over the weekend could represent a major breakthrough towards achieving a long-term solution to the Latin American debt crisis. The Mexican package may set a precedent which could be followed by other countries such as Brazil and Chile, seeking to extend the term of their rescheduling beyond that of their existing International Monetary Fund (IMF) programme and for Venezuela which has resolutely rejected an IMF programme.

There appears already to have been some closing of the gap between Venezuela and its creditor banks, which resumed negotiations last week. Venezuela has apparently been persuaded to abandon the principle of six annual payments. Venezuela has also become more flexible on the term of the rescheduling, while the banks seem prepared to compromise on the amount to be rescheduled.

Meanwhile, the sharp rise in copper prices which took the London Metal Exchange price up to its highest level in May should take some of the pressure off Chile, which is attempting to renegotiate its economic targets with the IMF. Chile based its economic projections for this year on an average copper price of 75 cents a pound only to see prices slump. Copper represents more than half of its export earnings and about half of these go on servicing its debt, the burden of which has increased with the rise in interest rates.

If sustained, the rise in copper prices should ease the pressure on Chile and make accommodation with the IMF easier. Chile has already drawn SDR 400m (\$487.4m) of its SDR 500m IMF facility due this year but still has some \$380m outstanding on its \$780m commercial bank loan, which is dependent on an IMF programme remaining in place. On the lending front, interest has

centred on Asia and the Far East. Indonesia came to the market last week for its second major fund raising this year with a \$500m dual-tranche credit in yen and Eurodollars on terms which are a little finer than on its previous \$750m loan. Meanwhile, Britain has followed the lead of its European neighbours in renegotiating better terms for existing loans. Last week the Electricity Council became the first UK borrower to do so. Although the authorities state that there has been no deliberate change in policy, other nationalised industries may well follow.

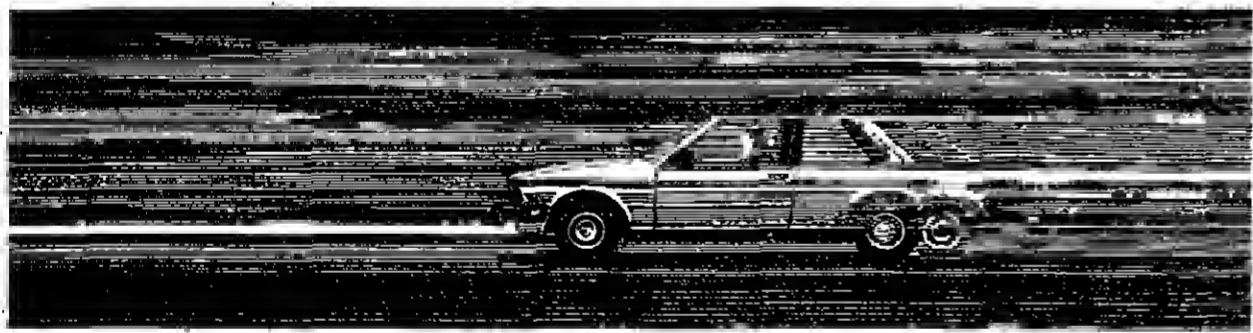
NEW INTERNATIONAL BOND ISSUES

Large table with columns: Borrowers, Amount, Maturity, Av. life, Coupon, Price, Lead Manager, Offer yield. Includes entries for U.S. DOLLARS, SWISS FRAMES, ECSC, etc.

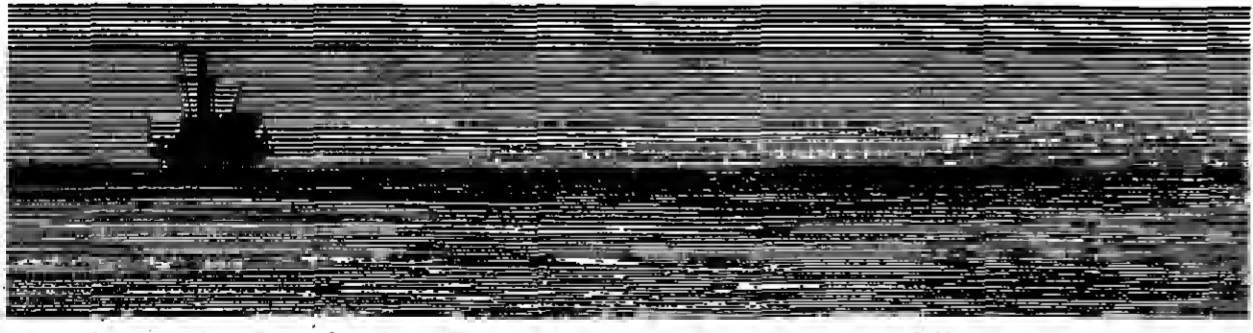
* Not yet priced... † Floating rate note: coupon is spread over 6-month Libor... (b) Spread over 3-month Libor... † With warrants. Note: Yields are calculated on ABB basis.



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INTERNATIONAL CAPITAL MARKETS AND COMPANIES

U.S. BONDS

FOMC report dulls prospects of early easing moves

THE FUTURE performance of the U.S. credit and money markets hangs in the balance...

Last week with the recent rally apparently rapidly running out of steam...

Several analysts noted that the announcement of the proposed "targeted" issues for foreign buyers has already caused an increase in the yield curve...

Table with columns: U.S. INTEREST RATES (%), Week to Week, Aug 28, Aug 17. Rows include Fed funds, Treasury bills, AAA utility, etc.

marginally lowered for the June to September period but most market participants read little into this...

Likewise, the slight upward adjustment of the Federal Funds intermeeting monitoring range to 8-12 per cent had been expected...

Thus the report contained few surprises but nevertheless appeared to dull the prospects for any early easing move...

There is a general consensus that the pace of economic expansion in the U.S. is now

AMC to increase Renault business

BY KENNETH GOODING IN DETROIT

AMERICAN MOTORS, number four in the U.S. motor league, is spending \$500m to \$600m a year to buy cars and components from Renault...

Mr Paul Tippett, AMC chairman, said yesterday his company was two years into a \$1.7bn investment programme...

For example, a 2.2 litre Renault diesel will soon be introduced to the new AMC Jeep in the U.S. the first time a diesel engine has been offered in a small Jeep.

Renault owns 46 per cent of AMC and the U.S. group is basing its new cars on Renault designs, while using its own expertise to revamp the Jeep four-wheel-drive range.

built for Renault by Matra in France, but no decision had been made yet. He pointed out sales volumes would be low in view of the restricted production (Matra might make a maximum of 40,000 a year) but the Espace would do a great deal for Renault's image in the U.S. if it was introduced.

Next year, AMC's U.S. sales will be boosted by the introduction of a pick-up version of the new Jeep. Mr Tippett said he would be disappointed if 1985 sales did not reach 50,000—and that would be entirely unrealistic because AMC is not in the pick-up market at the moment.

AMC has also revised upwards sales forecasts for a convertible version of the Alliance (based on the R9) to be introduced this autumn. Mr Tippett said about 16,000 would be sold next year against previous estimates of only half that number.

CIT-Alcatel raises stake in U.S. group

BY PAUL BETTS IN PARIS

CIT-ALCATEL, the leading French telecommunications equipment manufacturer, is to reinforce its bridgehead on the U.S. market by buying more shares in the Reno-based Lynch telecommunications group...

The French company, controlled by the nationalised CGE electronics conglomerate, has agreed to buy 550,000 shares in Lynch for \$11m.

The transaction, which must be cleared by the French Government, is the latest move in CIT-Alcatel's efforts to penetrate the U.S. telecommunications market in the wake of the deregulation of the American telephone market and the break-up of the American Telephone and Telegraph (AT&T) monopoly.

CIT-Alcatel acquired its initial 25 per cent stake in Lynch in 1981. The U.S. company has since expanded its French group to convert its equipment, including its E-10 digital switch system, to U.S. standards.

The new company appears to reflect an attempt by the French group to follow in the footsteps of other major international engineering and electronics groups which have been building up a major presence in factory automation and robotics.

CGE, which would like eventually to take a 5 per cent share of the world factory automation market, is also interested in opening its new CGP subsidiary to foreign partners. The French group's foreign companies could participate in CGP's capital or cooperate industrially with the new subsidiary.

Saudi builder calls in New York adviser

By Mary Frings in Bahrain

MORGAN STANLEY, the New York investment bank has been called in as financial adviser to Ali and Fahd Shobokshi, the troubled Saudi construction group, and is working on a general restructuring of the Jeddah-based company's financial obligations.

Bankers in Bahrain say there will be several different arrangements with groups of some 80 lending banks to meet Shobokshi's immediate working capital needs and restructure its medium- and long-term debt which is estimated at SR 1.2bn (\$400m).

Shobokshi, one of Saudi Arabia's biggest contracting companies after Bin Laden, has diversified interests in trading and property development, and has had cash flow problems for several months as a result of delays on payments on contract work owned by the Mondadori publishing group.

In May, Al Bahrain Arab African Bank (ALBAAB) arranged a \$46m restructuring package with a syndicate of 10 other banks for the outstanding portion of a \$102m medium-term loan, but this facility was not utilised because the borrower did not meet certain conditions.

Paul Taylor

Italian publisher in TV disposal

BY ALAN FRIEDMAN IN MILAN

THE ITALIAN television empire of Sig Silvio Berlusconi, the Milanese entrepreneur whose brass commercial stations have been challenging state-run television, is to grow even larger as a result of an agreement yesterday under which the Berlusconi group will take 50 per cent of Rete Quattro, the new station broadcast network owned by the Mondadori publishing group.

Mondadori, Italy's biggest publishing group, said it had agreed to sell 51 of its programmes to Sig Berlusconi's Fininvest holding company for L105bn (\$59m). The Rete Quattro network features a mixture of flashy variety and American crime shows. It is to be put into liquidation and reconstituted immediately as Rete Quattro Mark-Two.

The assets of Rete-Quattro—including its stations, broadcast equipment and other materials—should be valued at about L50bn. Rete Quattro last year made a loss of L26bn on turnover of L140bn.

The Mondadori group, which has been looking for a financial injection for its television network, last year made a L60m net profit on turnover of L1,000bn.

After the deal is complete, Mondadori will retain a 50 per cent stake and the managing director of Rete Quattro will be Sig Roberto Casini. Sig Pippo Berlusconi, Mondadori's most prestigious publishing house in Italy and controls close to half of the country's book market.

Loan policy slows growth in profits at Public Bank

BY WONG SULONG IN KUALA LUMPUR

A DELIBERATE policy of slowing down loans has acted as a brake to the profit growth of public bank, Malaysia's third largest bank. Pre-tax for the first half of 1984 fell marginally to 36m ringgit (\$15.6m), although after-tax profit was still 7.7 per cent higher at 20.2m ringgit.

In the past five years, Public Bank has propelled itself through aggressive lending into one of Malaysia's leading banks with growth rates exceeding 30 per cent annually. However, for the first half, although deposits rose strongly by 43 per cent to 4,149m ringgit, loans growth moderated to 16 per cent to 2,371m ringgit.

The bank had slowed down lending to the property market in line with advice of the Malaysian Central Bank.

French retailer in U.S. deal

CASINO, a leading French retail and food group, says its bid for control of Smart and Final Iris Corporation, which was formerly known as Thriftmart, Casino USA will acquire all outstanding SFI shares that it does not already own.

The takeover is subject to French Government authorisation and financing arrangements. Company officials were not available for comment.

Merrill Lynch HQ to be centralised in New York

BY DAVID BLACKWELL IN NEW YORK

MERRILL LYNCH, the world's leading securities broker and a major force in financial services, plans to move its corporate headquarters to the World Financial Centre, now under construction near the World Trade Centre in downtown Manhattan.

In March 1983 Amer, one of Merrill Lynch's prime competitors in the financial services field, said it was moving to the same location.

Merrill Lynch will occupy two buildings, which will be owned by a joint venture with Olympia and York, the developer of the 8m sq ft complex. The move will consolidate Merrill's 11 headquarters and administrative facilities throughout Manhattan, and put a cap on its long-term occupancy costs.

The joint venture would provide the company with a share of the residual value of the buildings and the financial and operational occupancy costs. The two buildings will give Merrill 1.8m sq ft of space. The first 34-story building will be ready for occupancy in mid-1985 and the second 44-story building is scheduled for completion in 1987.

In separate transactions, Merrill is to sell its 1.8m sq ft headquarters in Liberty City and its lease in the building for undisclosed sums to Olympia and York.

"We estimate that our occupancy costs will be at least 25 per cent less with our new strategy than if we continued to lease," said Mr Edward N. Moriarty, Merrill executive vice-president.

The joint venture would provide the company with a share of the residual value of the buildings and the financial and operational occupancy costs. The two buildings will give Merrill 1.8m sq ft of space.

Advertisement for THE REPUBLIC OF ITALY U.S. \$500,000,000 Floating Rate Notes due 1999. Includes logos and bank names like Banca Commerciale Italiana, Credit Suisse First Boston Limited, etc.

Advertisement for DAI-ICHI KANGYO BANK NEDERLAND N.V. Dfls 50,000,000 8 1/2% bearer Notes 1984 due August 15, 1989. Lists various banks and locations.

FT INTERNATIONAL BOND SERVICE table with columns: U.S. DOLLAR STRAIGHTS, SWEDEN KINGDOM, EUROPEAN BOND SERVICE, etc. Includes bond names, yields, and prices.

APPOINTMENTS

New development chief for ICFC

Mr Richard Connell, 29, is the new business development manager of ICFC, a division of Investors in Industry, a source of private venture capital for smaller businesses. Mr Connell joined ICFC, part of I.I., in 1980, working first as an investment controller in Leicester, before transferring to ICFC's head office in London in 1982.

INTERNATIONAL APPOINTMENTS Texas Instruments makes three marketing changes

TEXAS INSTRUMENTS DATA SYSTEMS DIVISION has created three new marketing appointments with responsibilities for the range of microcomputer products.

This advertisement complies with the requirements of the Council of The Stock Exchange. U.S. \$150,000,000

Chemical New York Corporation

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Closing prices, August 27

NEW YORK STOCK EXCHANGE COMPOSITE CLOSING PRICES

12 Month	Low	High	Stock	Dr. Yld. %	P/E	100s High	Low	Open	Close	12 Month	Low	High	Stock	Dr. Yld. %	P/E	100s High	Low	Open	Close	
12.1	10.0	12.5	AIR	4.2	10.0	100	10.0	10.0	10.0	12.1	10.0	12.5	AMC	4.2	10.0	100	10.0	10.0	10.0	
12.2	10.1	12.6	AIR	4.2	10.0	100	10.1	10.1	10.1	12.2	10.1	12.6	AMC	4.2	10.0	100	10.1	10.1	10.1	10.1
12.3	10.2	12.7	AIR	4.2	10.0	100	10.2	10.2	10.2	12.3	10.2	12.7	AMC	4.2	10.0	100	10.2	10.2	10.2	10.2
12.4	10.3	12.8	AIR	4.2	10.0	100	10.3	10.3	10.3	12.4	10.3	12.8	AMC	4.2	10.0	100	10.3	10.3	10.3	10.3
12.5	10.4	12.9	AIR	4.2	10.0	100	10.4	10.4	10.4	12.5	10.4	12.9	AMC	4.2	10.0	100	10.4	10.4	10.4	10.4
12.6	10.5	13.0	AIR	4.2	10.0	100	10.5	10.5	10.5	12.6	10.5	13.0	AMC	4.2	10.0	100	10.5	10.5	10.5	10.5
12.7	10.6	13.1	AIR	4.2	10.0	100	10.6	10.6	10.6	12.7	10.6	13.1	AMC	4.2	10.0	100	10.6	10.6	10.6	10.6
12.8	10.7	13.2	AIR	4.2	10.0	100	10.7	10.7	10.7	12.8	10.7	13.2	AMC	4.2	10.0	100	10.7	10.7	10.7	10.7
12.9	10.8	13.3	AIR	4.2	10.0	100	10.8	10.8	10.8	12.9	10.8	13.3	AMC	4.2	10.0	100	10.8	10.8	10.8	10.8
13.0	10.9	13.4	AIR	4.2	10.0	100	10.9	10.9	10.9	13.0	10.9	13.4	AMC	4.2	10.0	100	10.9	10.9	10.9	10.9
13.1	11.0	13.5	AIR	4.2	10.0	100	11.0	11.0	11.0	13.1	11.0	13.5	AMC	4.2	10.0	100	11.0	11.0	11.0	11.0
13.2	11.1	13.6	AIR	4.2	10.0	100	11.1	11.1	11.1	13.2	11.1	13.6	AMC	4.2	10.0	100	11.1	11.1	11.1	11.1
13.3	11.2	13.7	AIR	4.2	10.0	100	11.2	11.2	11.2	13.3	11.2	13.7	AMC	4.2	10.0	100	11.2	11.2	11.2	11.2
13.4	11.3	13.8	AIR	4.2	10.0	100	11.3	11.3	11.3	13.4	11.3	13.8	AMC	4.2	10.0	100	11.3	11.3	11.3	11.3
13.5	11.4	13.9	AIR	4.2	10.0	100	11.4	11.4	11.4	13.5	11.4	13.9	AMC	4.2	10.0	100	11.4	11.4	11.4	11.4
13.6	11.5	14.0	AIR	4.2	10.0	100	11.5	11.5	11.5	13.6	11.5	14.0	AMC	4.2	10.0	100	11.5	11.5	11.5	11.5
13.7	11.6	14.1	AIR	4.2	10.0	100	11.6	11.6	11.6	13.7	11.6	14.1	AMC	4.2	10.0	100	11.6	11.6	11.6	11.6
13.8	11.7	14.2	AIR	4.2	10.0	100	11.7	11.7	11.7	13.8	11.7	14.2	AMC	4.2	10.0	100	11.7	11.7	11.7	11.7
13.9	11.8	14.3	AIR	4.2	10.0	100	11.8	11.8	11.8	13.9	11.8	14.3	AMC	4.2	10.0	100	11.8	11.8	11.8	11.8
14.0	11.9	14.4	AIR	4.2	10.0	100	11.9	11.9	11.9	14.0	11.9	14.4	AMC	4.2	10.0	100	11.9	11.9	11.9	11.9
14.1	12.0	14.5	AIR	4.2	10.0	100	12.0	12.0	12.0	14.1	12.0	14.5	AMC	4.2	10.0	100	12.0	12.0	12.0	12.0
14.2	12.1	14.6	AIR	4.2	10.0	100	12.1	12.1	12.1	14.2	12.1	14.6	AMC	4.2	10.0	100	12.1	12.1	12.1	12.1
14.3	12.2	14.7	AIR	4.2	10.0	100	12.2	12.2	12.2	14.3	12.2	14.7	AMC	4.2	10.0	100	12.2	12.2	12.2	12.2
14.4	12.3	14.8	AIR	4.2	10.0	100	12.3	12.3	12.3	14.4	12.3	14.8	AMC	4.2	10.0	100	12.3	12.3	12.3	12.3
14.5	12.4	14.9	AIR	4.2	10.0	100	12.4	12.4	12.4	14.5	12.4	14.9	AMC	4.2	10.0	100	12.4	12.4	12.4	12.4
14.6	12.5	15.0	AIR	4.2	10.0	100	12.5	12.5	12.5	14.6	12.5	15.0	AMC	4.2	10.0	100	12.5	12.5	12.5	12.5
14.7	12.6	15.1	AIR	4.2	10.0	100	12.6	12.6	12.6	14.7	12.6	15.1	AMC	4.2	10.0	100	12.6	12.6	12.6	12.6
14.8	12.7	15.2	AIR	4.2	10.0	100	12.7	12.7	12.7	14.8	12.7	15.2	AMC	4.2	10.0	100	12.7	12.7	12.7	12.7
14.9	12.8	15.3	AIR	4.2	10.0	100	12.8	12.8	12.8	14.9	12.8	15.3	AMC	4.2	10.0	100	12.8	12.8	12.8	12.8
15.0	12.9	15.4	AIR	4.2	10.0	100	12.9	12.9	12.9	15.0	12.9	15.4	AMC	4.2	10.0	100	12.9	12.9	12.9	12.9
15.1	13.0	15.5	AIR	4.2	10.0	100	13.0	13.0	13.0	15.1	13.0	15.5	AMC	4.2	10.0	100	13.0	13.0	13.0	13.0
15.2	13.1	15.6	AIR	4.2	10.0	100	13.1	13.1	13.1	15.2	13.1	15.6	AMC	4.2	10.0	100	13.1	13.1	13.1	13.1
15.3	13.2	15.7	AIR	4.2	10.0	100	13.2	13.2	13.2	15.3	13.2	15.7	AMC	4.2	10.0	100	13.2	13.2	13.2	13.2
15.4	13.3	15.8	AIR	4.2	10.0	100	13.3	13.3	13.3	15.4	13.3	15.8	AMC	4.2	10.0	100	13.3	13.3	13.3	13.3
15.5	13.4	15.9	AIR	4.2	10.0	100	13.4	13.4	13.4	15.5	13.4	15.9	AMC	4.2	10.0	100	13.4	13.4	13.4	13.4
15.6	13.5	16.0	AIR	4.2	10.0	100	13.5	13.5	13.5	15.6	13.5	16.0	AMC	4.2	10.0	100	13.5	13.5	13.5	13.5
15.7	13.6	16.1	AIR	4.2	10.0	100	13.6	13.6	13.6	15.7	13.6	16.1	AMC	4.2	10.0	100	13.6	13.6	13.6	13.6
15.8	13.7	16.2	AIR	4.2	10.0	100	13.7	13.7	13.7	15.8	13.7	16.2	AMC	4.2	10.0	100	13.7	13.7	13.7	13.7
15.9	13.8	16.3	AIR	4.2	10.0	100	13.8	13.8	13.8	15.9	13.8	16.3	AMC	4.2	10.0	100	13.8	13.8	13.8	13.8
16.0	13.9	16.4	AIR	4.2	10.0	100	13.9	13.9	13.9	16.0	13.9	16.4	AMC	4.2	10.0	100	13.9	13.9	13.9	13.9
16.1	14.0	16.5	AIR	4.2	10.0	100	14.0	14.0	14.0	16.1	14.0	16.5	AMC	4.2	10.0	100	14.0	14.0	14.0	14.0
16.2	14.1	16.6	AIR	4.2	10.0	100	14.1	14.1	14.1	16.2	14.1	16.6	AMC	4.2	10.0	100	14.1	14.1	14.1	14.1
16.3	14.2	16.7	AIR	4.2	10.0	100	14.2	14.2	14.2	16.3	14.2	16.7	AMC	4.2	10.0	100	14.2	14.2	14.2	14.2
16.4	14.3	16.8	AIR	4.2	10.0	100	14.3	14.3	14.3	16.4	14.3	16.8	AMC	4.2	10.0	100	14.3	14.3	14.3	14.3
16.5	14.4	16.9	AIR	4.2	10.0	100	14.4	14.4	14.4	16.5	14.4	16.9	AMC	4.2	10.0	100	14.4	14.4	14.4	14.4
16.6	14.5	17.0	AIR	4.2	10.0	100	14.5	14.5	14.5	16.6	14.5	17.0	AMC	4.2	10.0	100	14.5	14.5	14.5	14.5
16.7	14.6	17.1	AIR	4.2	10.0	100	14.6	14.6	14.6	16.7	14.6	17.1	AMC	4.2	10.0	100	14.6	14.6	14.6	14.6
16.8	14.7	17.2	AIR	4.2	10.0	100	14.7	14.7	14.7	16.8	14.7	17.2	AMC	4.2	10.0	100	14.7	14.7	14.7	14.7
16.9	14.8	17.3	AIR	4.2	10.0	100	14.8	14.8	14.8	16.9	14.8	17.3	AMC	4.2	10.0	100	14.8	14.8	14.8	14.8
17.0	14.9	17.4	AIR	4.2	10.0	100	14.9	14.9	14.9	17.0	14.9	17.4	AMC	4.2	10.0	100	14.9	14.9	14.9	14.9
17.1	15.0	17.5	AIR	4.2	10.0	100	15.0	15.0	15.0	17.1	15.0	17.5	AMC	4.2	10.0	100	15.0	15.0	15.0	15.0
17.2	15.1	17.6	AIR	4.2	10.0	100	15.1	15.1	15.1	17.2	15.1	17.6	AMC	4.2	10.0	100	15.1	15.1	15.1	15.1
17.3	15.2	17.7	AIR	4.2	10.0	100	15.2	15.2	15.2	17.3	15.2	17.7	AMC	4.2	10.0	100	15.2	15.2	15.2	15.2
17.4	15.3	17.8	AIR	4.2	10.0	100	15.3	15.3	15.3	17.4	15.3	17.8	AMC	4.2	10.0	100	15.3	15.3	15.3	15.3
17.5	15.4	17.9	AIR	4.2	10.0	100	15.4	15.4	15.4	17.5	15.4	17.9	AMC	4.2	10.0	100	15.4	15.4	15.4	15.4
17.6	15.5	18.0	AIR	4.2	10.0	100	15.5	15.5	15.5	17.6	15.5	18.0	AMC	4.2	10.0	100	15.5	15.5	15.5	15.5
17.7	15.6	18.1	AIR	4.2	10.0	100	15.6	15.6	15.6	17.7	15.6	18.1	AMC	4.2	10.0	100	15.6	15.6	15.6	15.6
17.8	15.7	18.2	AIR	4.2	10.0	100	15.7	15.7	15.7	17.8	15.7	18.2	AMC	4.2	10.0	1				

AMERICAN STOCK EXCHANGE COMPOSITE CLOSING PRICES

Closing prices, August 27

Main table of American stock exchange closing prices, organized into columns with headers for 12 Month High/Low, Stock, Div. Yld., P/E, etc.

Continued on Page 18

NEW YORK STOCK EXCHANGE COMPOSITE CLOSING PRICES

Main table of New York stock exchange closing prices, organized into columns with headers for 12 Month High/Low, Stock, Div. Yld., P/E, etc.

Continued on Page 18

Notes on data: Prices are unofficial. Current high and low reflect the previous 52 weeks... Dividend data is based on the latest distribution.

WORLD STOCK MARKETS

Table of world stock markets including Austria, Germany, Norway, Australia, Japan, and others. Columns include stock names, prices, and changes.

Table of over-the-counter stocks and Nasdaq national market closing prices. Includes columns for stock names, prices, and changes.

Table of American stock exchange closing prices for Toronto. Columns include stock names, prices, and changes.

Table of New York closing prices. Columns include stock names, prices, and changes.

Table of American stock exchange closing prices. Columns include stock names, prices, and changes.

Advertisement for The Advertising Standards Authority. Text: 'It's easy to complain about advertisements. Every week, millions of advertisements appear in the press, on posters or in the cinema. Most of them comply with the rules contained in the British Code of Advertising Practice and are legal, decent, honest and truthful. But if you find one that, in your opinion, is wrong in some way, please write to us at the address below. We'd like you to help us keep advertising up to standard.' Includes logo and contact information.

WORLD STOCK MARKETS

OVER-THE-COUNTER

Table of over-the-counter stock prices including columns for Stock, Sales, High, Low, Last, and Change. Includes sub-sections like 'Continued from Page 18' and 'K-K'.

WALL STREET

Reassessing induces setback

FINANCIAL MARKETS suffered a setback on Wall Street yesterday with a sharp early fall in stock prices being attributed to a degree of weakness in the credit markets which took some operators by surprise, writes Michael Morgan in New York. Trading was unusually slow, however, and this was attributed to a heavy holiday schedule affecting parts of Wall Street.

EUROPE

Oils prove source of inspiration

A BELIEF among European investors that the influences governing last week's market movements had not yet run their course was evident yesterday although some bourses were deflated due to the closure of London markets. A number of oil shares on different exchanges featured strongly, however. Paris opened the week with investors stimulated by a cut in the call money rate to 10% per cent from 11% while the start of the new account on Friday continued to prompt buy orders. The main feature of the session was Petroles BP which spurred ahead by 32.5 per cent with a FFr 27.30 gain to FFr 111 after Friday's suspension due to a buying imbalance. The group is a member of a consortium led by Elf which has discovered oil near Pau, south-west France. Elf finished unchanged at FFr 235, after a rise of over 10 per cent in the last week.

NEW YORK - Dow Jones table with columns for date, index value, and change.

STANDARD AND POORS table with columns for date, index value, and change.

WORLD INDICES table listing various international stock indices and their values.

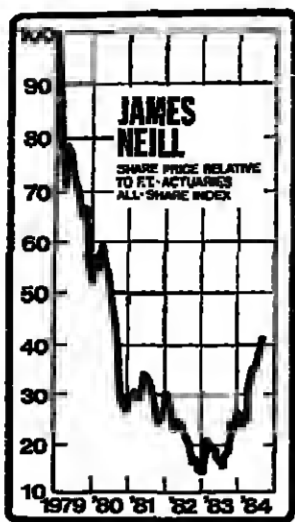
Large advertisement for Gulf Air featuring a Gulf Air aircraft, the slogan 'Dubai daily from Heathrow at 10.00* Except Saturday', and contact information for travel agents.

UK COMPANY NEWS

RECENT ISSUES

Stefan Wagstyl looks at James Neill's recovery Having to move fast to repel boarders

James Neill, the Sheffield-based maker of band tools which is staging a rapid recovery, might be forgiven for feeling wary about the intentions of one of its biggest shareholders.



For last week, the day before Neill surprised the City with a 130 per cent increase in interim profits, the acquisitive Suter group, headed by Mr David Abell doubled its stake to over 10 per cent.

What Mr Abell had seen faster than others was the impact of a recovery programme launched only last November when Mr Peter Bullock, former managing director of lawnmower maker Flymo, took over as Neill's chief executive.

Re-rating setback for CU after U.S. losses

Commercial Union's loss making U.S. insurance operations have suffered another setback with the decision of A. M. Best, the leading U.S. insurance rating agency, to lower the rating on CU's U.S. property and casualty operations from A to B.

The new rating, which is still categorised as "very good" by the new Jersey-based rating agency, follows heavy losses by CU in the U.S. and its recent announcement of a major cut-back in its operations there.

Exeter Building disappoints at interim stage

PRE-TAX profits at Exeter Building and Construction Group fell from £27.0m to £15.0m in the six months to June 30 1983. Mr D. Stoneman, the chairman, describes the result as "disappointing".

Hongkong Rubber's winding up details

THE LIQUIDATORS of Hongkong Rubber state the funds available at the date of the company's liquidation, after providing for outstanding tax and other liabilities, a first distribution in the liquidation of £3.7 per share was made on July 7 amounting to £4.5m.

During the year the companies investments in Killingbali Tin (Malaysia) Berhad and H and C Layton Berhad, were sold realising £1.14m and £245,352 respectively, both being subject to UK corporation tax on the chargeable gains arising yet to be agreed with the Inland Revenue.

SHARE STAKES

Property Security Investment Trust - Mr J. G. Day, a director, has been asked to be interested in 5,000 ordinary shares. His total interests are now 35,575 Ordinary and 1,098 Preference shares.

Table of recent issues with columns for issue date, price, and company name.

Table of fixed interest stocks with columns for issue price, date, and company name.

Table of 'RIGHTS' offers with columns for issue price, date, and company name.

Table of pending dividends with columns for company name, date, and amount.

John Beales turns in £609,000

Pre-tax profit at John Beales Associated Companies was £609,000 in the 63 weeks to May 31 1984 compared with £441,000 in the 52 weeks to March 19 1983.

The final dividend is raised from 2p to 2.5p for a total of 3.65p for the 63-week period against 5p (52 weeks).

Advertisement for 3i Term Deposits with interest rates and terms.

Advertisement for ELORADO NUCLEAR LIMITED with details of shares and interest.

Large advertisement for SKF Group half-year report, including sales figures and company information.

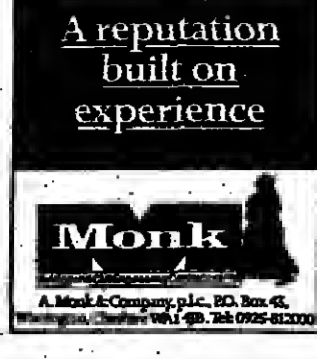
Advertisement for F. & C. PACIFIC INVESTMENT TRUST PLC, including details of shareholding and company news.

Advertisement for Granville & Co. Limited, including details of shareholding and company information.

Table of Financial Times Stock Indices showing various market indices and their values.

Advertisement for LADBROKE INDEX, including details of the index and contact information.

Advertisement for Granville & Co. Limited, including details of shareholding and company information.



CONSTRUCTION CONTRACTS £35m orders for Aberdeen Construction

ABERDEEN CONSTRUCTION GROUP reports the award of contracts worth £35m to subsidiaries...

valued at £2.1m and one for £2.1m to build 116 houses at Anesbury in a housing partnership...

Henry Boot to build £25m Hong Kong container depot

As part of major expansion plans under way at the third largest container terminal in the world...

Work in the north for London and Northern

Tractor Shovels (Contracts) a LONDON AND NORTHERN GROUP company...

Design and build for Shepherd

Five design and build contracts with a total value over £7.5m have been won by SHEPHERD BUILDING SERVICE...

Miller Buckley has £5m work

Miller Buckley Construction, part of the Miller Buckley Group...



"We got it! We got the pyramid contract!" Drawing by Chas. Adams. © 1984 The New Yorker Magazine, Inc.

worth over £5m. The complex will be added to Great Hotels at Maidenhead...

CRITALL WINDOWS has won a £600,000 order for the Saudi Embassy in Riyadh...

FAIRCLOUGH BUILDING has won a £3m contract for construction of a new type of mechanised letter sorting office in Ipswich...

1985, work has begun on the 67-week contract for the Post Office's eastern postal region...

Two contracts, together worth over £1m, for altering and fitting out office buildings have been awarded to MYTON...

English Estates has awarded a contract worth £500,000 to KASS CONSTRUCTION, Scunthorpe, for site development on phase

WEEK'S FINANCIAL DIARY

The following is a record of the principal business and financial engagements during the week...

Table with columns for date, time, event, and location. Includes sections for Monday, Tuesday, Wednesday, Thursday, and Friday.

Wider OAP rail travel urged

THE Greater London Council is urging the Government to allow British Rail to accept a £2.5m offer from the council to extend the GLC's free travel scheme for the elderly to BR's services...

Businesses Wanted

HOUSEWARES COMPANY REQUIRED. Contact Peter Cartwright 0384 66304.

U.K. Food Distributor. U.K. Company has funds available to purchase companies involved in transport distribution...

INVESTOR. wants to purchase Plastic Moulding company with factory working in G.R.P. Ample funds available...

CORTON BEACH P.L.C. We are a rapidly expanding group of companies involved in Food Manufacturing and distribution...

FREIGHT FORWARDING COMPANY WANTED. Established freight forwarder with existing specialised business...

WANTED. Transport Hireage Companies including removals, business vans, etc.

HEATING/VENTILATING and/or Air Conditioning Service Company with good working relationships...

PHOTO PROCESSING: WE NEED MORE CAPACITY. Our continuing success means that we are short of processing capacity...

TENDERS FOR GREATER LONDON BILLS. The Greater London Council hereby give notice that tenders will be invited...

UK COMPANY. wishes to acquire established profitable business in industrial safety...

Company Notices. The Greater London Council hereby give notice that tenders will be invited...

UK COMPANY. wishes to acquire established profitable business in industrial safety...

Company Notices. The Greater London Council hereby give notice that tenders will be invited...

UK COMPANY. wishes to acquire established profitable business in industrial safety...

Company Notices. The Greater London Council hereby give notice that tenders will be invited...

Clubs. WFL has received the above because of a change in the club's name...

Art Galleries. AGNES GALLERY, 11 Old Bond St. W1.

Contracts & Tenders

Registration of Interest STUDY of need for and means of accommodating large ships for export coal at NSW ports (AUSTRALIA). The NSW Coal Association and the Maritime Services Board of NSW are seeking registration of interest...

LEEDS AND BRADFORD AIRPORT JOINT COMMITTEE NEW DUTY FREE SHOP. Applications are invited from suitably experienced organisations wishing to be considered for the operation of a new Duty Free Shop...



BRITISH AEROSPACE. The new aircraft was marshalling time in the air 31 minutes. This Pendolinozug... Diesse gezeichnete 18 Plätze und... Verkaufstem von einer Konferenz ab... Flugzeug mit nur 18 Plätzen...

FT UNIT TRUST INFORMATION SERVICE

AUTHORISED UNIT TRUSTS

Table listing various unit trusts such as British Group, Abbey Unit Trusts, and others, with columns for name, value, and change.

Table listing unit trusts under the heading 'Funds in Court' and 'Key Fund Managers Ltd', including names like British Group and Abbey Unit Trusts.

Table listing unit trusts under the heading 'Perpetual Unit Trust Managers' and 'Prudential Unit Trust Managers', including names like Perpetual and Prudential.

Table listing unit trusts under the heading 'City of Westminster Assurance' and 'General Purpose Life Ins. PLC', including names like City of Westminster and General Purpose.

F.T. CROSSWORD PUZZLE No. 5502

- 1 Natural desires changed
2 Stonerom's work (8, 6)
3 Creative cycle of black alpaca (5)
4 In depression about neat
5 Orientat showing toss (9)
6 Look to poet who used to
7 Make metal parts (7)
8 Quiet worker goes to Govern
9 with right animal (7)
10 Buyer's option—he has a (10)
11 Persistent as Wordsworth's
12 questioners (9)
13 Fan seen to drink dark ale
14 (9)
15 Mary's type of architecture?
16 (7)
17 Had to get round poor Theo
18 —he's excitable (7)
19 French King has way with
20 two Queens, the reveller!
21 (9)
22 A way in Church for Sudra
23 for example (5)
24 Royalty have kind of bed for
25 plant (7-7)
26 Discourage for example
27 going up to cleanse (7)
28 Heavens! Where 6 may work
29 is a space station (8)
30 A topic maybe about C.I.D.
31 raised—it's beyond doubt (9)
32 Additional amount on French
33 loan (8)
34 Frank often appears above
35 one (8)
36 Incite trouble about river
37 pump (7)
38 Get back and think again?
39 (6)
40 No joke—I discover an ante-
41 pole (5)
42 Soldier and "Kidnapped"
43 creator join young women
44 (5)
45 Bird with bill tucked in is
46 silent (5)
47 The solution to last Saturday's
48 prize puzzle will be published
49 with names of winners next
50 Saturday.

Crossword puzzle grid with numbers 1 through 48 indicating starting positions for clues.

Table listing unit trusts under the heading 'Investment Fund Managers Ltd' and 'Key Fund Managers Ltd', including names like Investment Fund and Key Fund Managers.

Table listing unit trusts under the heading 'Key Fund Managers Ltd' and 'Perpetual Unit Trust Managers', including names like Key Fund Managers and Perpetual.

Table listing unit trusts under the heading 'City of Westminster Assurance' and 'General Purpose Life Ins. PLC', including names like City of Westminster and General Purpose.

Handwritten signature or mark at the bottom of the page.

INSURANCE, OVERSEAS & MONEY FUNDS

Table listing various insurance and financial products, including Life Assurance Co. Ltd, National Provident Institution, and others, with columns for company name, address, and contact information.

Table listing insurance and financial products, including Sme & Prosser Group, Target Life Assurance Co. Ltd, and others, with columns for company name, address, and contact information.

Table listing insurance and financial products, including DAL Investments (10M) Ltd, Capital International Fund S.A., and others, with columns for company name, address, and contact information.

Table listing insurance and financial products, including Marine Mutual (C) Ltd, Strathclyde Management Limited, and others, with columns for company name, address, and contact information.

OFFSHORE AND OVERSEAS

Advertisement for offshore and overseas services, including details about investment and insurance options.

Money Market Trust Funds

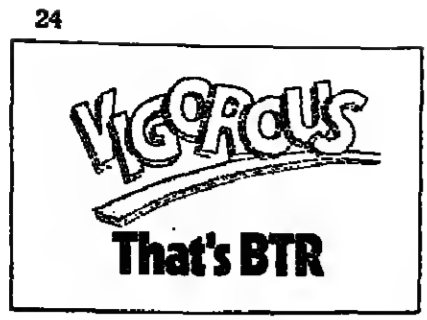
Advertisement for Money Market Trust Funds, listing various fund names and their details.

Money Market Bank Accounts

Advertisement for Money Market Bank Accounts, listing various bank account options and their features.

NOTES

NOTES section containing various financial notices, updates, and information for investors.



FT LONDON SHARE INFORMATION SERVICE

BRITISH FUNDS

Table of British Funds with columns for Name, Price, and Yield. Includes sub-sections for 'Shorts' (Lives up to Five Years) and 'Five to Fifteen Years'.

Over Fifteen Years

Table of funds categorized as 'Over Fifteen Years'.

Undated

Table of undated funds.

Index-Linked

Table of index-linked funds.

INT. BANK AND O'SEAS GOVT STERLING ISSUES

Table of international bank and overseas government sterling issues.

CORPORATION LOANS

Table of corporation loans.

COMMONWEALTH AND AFRICAN LOANS

Table of commonwealth and African loans.

LOANS Building Societies

Table of loans from building societies.

Public Board and Ind.

Table of public board and industrial loans.

Financial

Table of financial instruments.

AMERICANS

Table of American stocks with columns for Name, Price, and Yield.

CANADIANS

Table of Canadian stocks.

BANKS, HP & LEASING

Table of banks, hire purchase, and leasing companies.

RENTALS

Table of rental companies.

Hire Purchase, Leasing, etc.

Table of hire purchase, leasing, and other services.

BEERS, WINES & SPIRITS

Table of beer, wine, and spirit stocks.

BEERS, WINES—Cont.

BUILDING INDUSTRY, TIMBER AND WOODS

Table of building industry, timber, and wood stocks.

ELECTRICALS

Table of electrical stocks.

CHEMICALS, PLASTICS

Table of chemical and plastic stocks.

DRAPERY AND STORES

Table of drapery and store stocks.

ENGINEERING

Table of engineering stocks.

HOTELS AND CATERERS

Table of hotel and caterer stocks.

INDUSTRIALS (Miscel.)

Table of miscellaneous industrial stocks.

DRAPERY & STORES—Cont.

Table of drapery and store stocks (continued).

ELECTRICALS

Table of electrical stocks (continued).

CHEMICALS, PLASTICS

Table of chemical and plastic stocks (continued).

DRAPERY AND STORES

Table of drapery and store stocks (continued).

ENGINEERING

Table of engineering stocks (continued).

HOTELS AND CATERERS

Table of hotel and caterer stocks (continued).

INDUSTRIALS (Miscel.)

Table of miscellaneous industrial stocks (continued).

ENGINEERING—Continued

Table of engineering stocks (continued).

ELECTRICALS

Table of electrical stocks (continued).

CHEMICALS, PLASTICS

Table of chemical and plastic stocks (continued).

DRAPERY AND STORES

Table of drapery and store stocks (continued).

ENGINEERING

Table of engineering stocks (continued).

HOTELS AND CATERERS

Table of hotel and caterer stocks (continued).

INDUSTRIALS (Miscel.)

Table of miscellaneous industrial stocks (continued).

INDUSTRIALS (Miscel.)

Large table of miscellaneous industrial stocks with columns for Name, Price, and Yield.

INDUSTRIALS—Continued

Table of industrial stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

LEISURE—Continued

Table of leisure stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

PROPERTY—Continued

Table of property stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

INVESTMENT TRUSTS—Cont.

Table of investment trusts including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

OIL AND GAS—Continued

Table of oil and gas stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

MOTORS, AIRCRAFT TRADES

Table of motor and aircraft trade stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

MOTORS AND CYCLES

Table of motor and cycle stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

COMMERCIAL VEHICLES

Table of commercial vehicle stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

COMPONENTS

Table of component stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

SHIPPING

Table of shipping stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

GARAGES AND DISTRIBUTORS

Table of garage and distributor stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

SHOES AND LEATHER

Table of shoe and leather stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

SOUTH AFRICANS

Table of South African stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

TEXTILES

Table of textile stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

OVERSEAS TRADERS

Table of overseas trader stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

NEWSPAPERS, PUBLISHERS

Table of newspaper and publisher stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

PAPER, PRINTING ADVERTISING

Table of paper, printing, and advertising stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

PLANTATIONS

Table of plantation stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

MINES

Table of mine stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

REGIONAL & IRISH STOCKS

Table of regional and Irish stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

NOMURA INTERNATIONAL LIMITED NEW-ERA INVESTMENT AND UNDERWRITING OFFICES WORLDWIDE 3 Grosvenor Street EC3V 6AD Telephone (01) 283 8811

MINES—Continued

Table of mine stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

TITANS

Table of Titan stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

MISCELLANEOUS

Table of miscellaneous stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

NOTES

Notes section containing financial information and company announcements.

FINANCE, LAND, ETC

Table of finance, land, and other stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

PROPERTY

Table of property stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

INSURANCES

Table of insurance stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

LEISURE

Table of leisure stocks including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

OPTIONS—3-month call rates

Table of 3-month call rates including companies like British Airways, British Petroleum, and British Telecom, with columns for stock price, last price, and volume.

CURRENCIES, MONEY and CAPITAL MARKETS

FOREIGN EXCHANGES

A general lack of direction

BY COLIN MILLHAM

The dollar drifted around without showing any definite direction last week. By the end of the week trading was so thin that few traders were prepared to take new positions in a very nervous and volatile market.

above the expected unchanged rise of 0.2 per cent, but was enough to create thoughts about possible inflationary pressure in the U.S. economy.

FINANCIAL FUTURES

LONDON

Table with columns for currency (THREE-MONTH EURO/DOLLAR), date, and price. Includes data for Sept, Oct, Nov, Dec, Jan, Feb, Mar, Apr, May, Jun, Jul, Aug.

U.S. TREASURY BONDS

Table with columns for bond type (e.g., 10-year, 30-year), date, and price. Includes data for Sept, Oct, Nov, Dec, Jan, Feb, Mar, Apr, May, Jun, Jul, Aug.

CHICAGO

Table with columns for currency (U.S. TREASURY BONDS), date, and price. Includes data for Sept, Oct, Nov, Dec, Jan, Feb, Mar, Apr, May, Jun, Jul, Aug.

EUROPEAN OPTIONS EXCHANGE

Large table with columns for Series, Vol., Last, and Price. Lists various options for Gold, Silver, and other currencies.

THE POUND SPOT AND FORWARD

Table with columns for Date, Day's Close, One month, and Three months. Shows pound spot and forward rates.

FORWARD RATES AGAINST STERLING

Table with columns for Currency, 1 month, 2 month, 3 month, and 12 month. Shows forward rates against sterling.

BANK OF ENGLAND TREASURY BILL TENDER

Table with columns for Bill type, Amount, and Yield. Shows details of Treasury bill tenders.

THE DOLLAR SPOT AND FORWARD

Table with columns for Date, Day's Close, One month, and Three months. Shows dollar spot and forward rates.

HOME COMPUTERS FOR THE BUSINESSMAN

The Financial Times proposes to publish a survey on Home Computers for the Businessman on the 1st October.

OTHER CURRENCIES

Table with columns for Currency, Rate, and Note Rates. Lists various international currencies and their exchange rates.

CURRENCY MOVEMENTS

Table with columns for Currency, Bank of England, and Morgan Guaranty. Shows currency movements and changes.

WEEKLY CHANGE IN WORLD INTEREST RATES

Table with columns for Location, Rate, and Change. Shows weekly changes in interest rates worldwide.

U.S. EUROPEAN CURRENCY UNIT RATES

Table with columns for Currency, Rate, and Change. Shows U.S. European currency unit rates.

INVEST IN 50,000 BETTER TOMORROWS!

Multiple sclerosis is the cause of many of our ailments which are still unknown - HELP US BRING THEM RELIEF AND HOPE.

EXCHANGE CROSS RATES

Table with columns for Currency, Rate, and Change. Shows exchange cross rates for various currencies.

EURO-CURRENCY INTEREST RATES

Table with columns for Currency, Rate, and Change. Shows Euro-currency interest rates.

MONEY MARKETS

Table with columns for Currency, Rate, and Change. Shows money market rates.

FT LONDON INTERBANK FIXING

Table with columns for Term, Rate, and Change. Shows FT London interbank fixing rates.

£ WORLD VALUE OF THE POUND

The table below gives the latest available rates of exchange for the pound sterling against other major currencies.

Change in sentiment

Sentiment changed quite dramatically on the London money market last week. Interbank interest rates showed a slightly reversed curve as the week began, and were generally hovering around 10 1/2 per cent.

MONEY RATES

Table with columns for Currency, Rate, and Change. Shows money rates for various currencies.

LONDON MONEY RATES

Table with columns for Currency, Rate, and Change. Shows London money rates.

MONEY RATES

Table with columns for Currency, Rate, and Change. Shows money rates for various currencies.

MONEY RATES

Table with columns for Currency, Rate, and Change. Shows money rates for various currencies.

FT LONDON INTERBANK FIXING

Table with columns for Term, Rate, and Change. Shows FT London interbank fixing rates.

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FINANCIAL TIMES SURVEY

Aerospace

The world's aerospace industries are slowly emerging from the recession, with cautious optimism for the immediate future. For the longer-term, the outlook is brighter, with hopes of a sustained volume of business to the end of the century that could be worth as much as \$1,400 bn.

THE WORLD'S aerospace industries will go to this year's Farnborough International Air Show conscious that the recession which severely affected a substantial sector of their business—commercial aviation—now appears to be passing. There have been encouraging signs in recent months of both a growth in world air travel, reflected in a so far slow, but nevertheless unmistakable, increase in new orders for commercial jet transports to revive flagging production lines.

At the same time, the steady volume of military aviation and guided weapons business that sustained many of those industries in the trough of the earlier recession also remains buoyant, while demand in the space sector for satellites and ancillary equipment of all kinds is accelerating rapidly.

There is therefore a new air of confidence in world aerospace, reflected in the fact that this year's Farnborough air show will be the biggest international air show yet held, both

By Michael Donne
AEROSPACE CORRESPONDENT

in terms of the number of exhibitors and in the size of the static and equipment displays.

Although the number of entirely new aircraft may be small by comparison with previous years, the significance of Farnborough for the world's

aerospace industries will be in the underlying trends—the new civil and military products and programmes under way for the long-term future, the increasing emphasis on new technology across a wide range of industrial and scientific disciplines, and the increasing awareness of and interest in aerospace matters of all kinds from the countries of the developing world.

The confidence so far being shown is cautious, for the recovery is only a few months old. But, if all the ventures now planned for the future come to fruition—civil, military and in space—the world's overall aerospace activity seems likely to expand considerably over the remaining years of this century. Manufacturers' forecasts vary widely, and are inevitably broadly based, but the most

conservative estimate is that the overall volume of new business in civil and military aircraft of all kinds, guided weapons and spacecraft to the year 2000 is likely to exceed \$1,400bn, and that if ancillary equipment, support costs for products in service, and the additional spending on the infrastructure of aerospace (such as the provision of new airports, new factories, and outlays on technological developments) are also taken into account, the figure may even be doubled.

In the air transport industry, too, analysis of the overall situation shows that the picture is looking much brighter. Over the first few months of this year, air traffic world-wide was up substantially over the corresponding period last year and the signs are that in the years ahead, there will be an average annual growth of at least 5 per cent, and possibly approaching 7 per cent. While this is well below the growth rates of 10 per cent or more experienced in the late 1970s, it is still sufficient to ensure that world air traffic will double by the early 1990s, and it is already imposing renewed pressures on airport authorities to create more capacity, or at least to enable better use to be made of available runways and terminals where additional capacity is not possible for either cost, space or environmental reasons—the latter now a particularly severe constraint, especially in the UK, Western Europe and the US.

The airlines themselves are also now in a far better position to cope with their problems



Artist's impression of how the proposed new European Fighter Aircraft (EFA) may look. Efforts are now being made by the UK, France, West Germany, Italy and Spain to reach agreement on a major multi-billion pounds programme to develop this new combat aircraft for the early 1990s, to replace ageing Jaguar fighters and other types in European air forces

than they were two to three years ago. Managements, long accustomed to profits and growth, learned the hard way how to cope with crisis, losses and cut-backs, and although some airlines have gone out of business, the remainder, through extensive retrenchment programmes, are leaner, tougher and more competitive than they were. They need to be, for their difficulties are not yet over. Increased competition, and pressures for deregulation elsewhere than in the U.S., where it has been a feature of the past few years, are growing.

Decisions

In the UK alone, a major reconstruction of civil aviation is in progress, with the impending privatisation of British Airways, some reallocation of routes to the independent airlines planned, and major decisions on airports policy awaited (such as development of Stansted or a fifth terminal at Heathrow).

Coupled with the pressures for more competition on European and long-haul air routes these measures seem likely in the long term to strengthen the UK airline industry, and will eventually lead to increased orders for new equipment.

That the aircraft manufacturers are also doing better than for some considerable time past is reflected in figures from Airbus, Boeing and

McDonnell Douglas, all of whom so far this year have logged substantial increases in sales compared with the same period of last year. While some of this improvement is undeniably attributable to the improving economic climate among the airlines, it is being led by two other more significant factors.

One is that many existing fleets are ageing and re-equipment decisions that were deferred because of the recession cannot be deferred any longer if the airlines involved wish to remain competitive in the mid- to late-1980s. At the same time, the imminence of new, more stringent government-imposed noise regulations in the U.S. and elsewhere from the end of this year through the 1980s will increasingly oblige the airlines, however reluctantly, to replace their fleets.

It may be some time before this improved buying rate among the airlines is reflected in significantly improved production rates among the manufacturers. The improvement is coming none too soon, however, for some airliner manufacturers' production rates have already had to be cut for 1985 because of the paucity of new orders last year and earlier. It will probably not be much before 1986 that those rates will rise again, as the orders now coming on to the books

start to move through the production phase.

Nobody among the manufacturers is expecting an early boom in demand. Rather, a steady inflow of new orders seems likely, if only because the high cost of new aircraft, and the current high interest rates, are tending to reduce the sizes of such individual orders as are being placed.

Inflow

Nevertheless, although the various manufacturers' forecasts differ in detail, they are all confident that through the rest of this century, the overall demand for new commercial jet airliners will remain high. Airbus, for example, sees a market up to the end of the century of well over 7,000 new aircraft, worth some \$450bn. Boeing sets its forecast lower, in terms of time and money—about \$172bn for about 3,850 aircraft up to 1995. Rolls-Royce sees some \$50bn being spent on up to about 5,000 aircraft by the early 1990s, whereas Pratt and Whitney of the U.S. sees an eventual market by 1994 of about 4,200 aircraft, worth around \$173bn.

In addition, Pratt and Whitney sees a market up to 1994 for some 28,500 general aviation aircraft of all kinds, worth about \$75bn, covering light aircraft for leisure as well as business and executive aviation.

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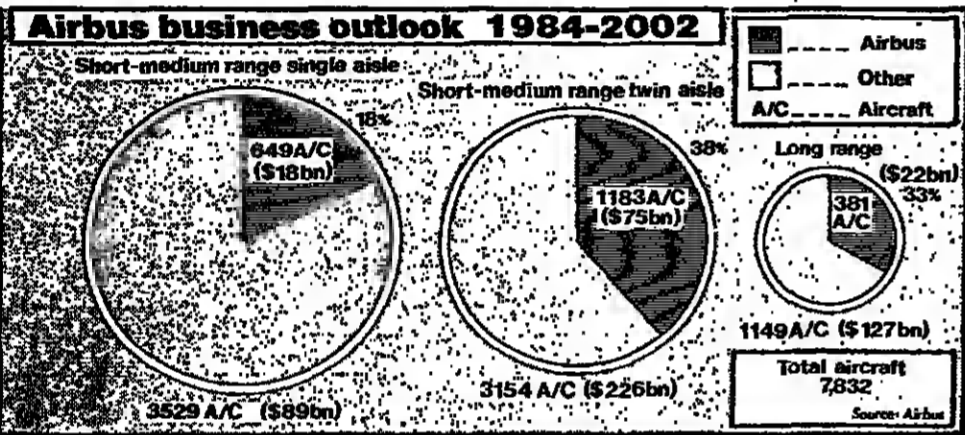
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Editorial production: Michael Strutt and Arthur Dawson



The Jewels in our Crown.

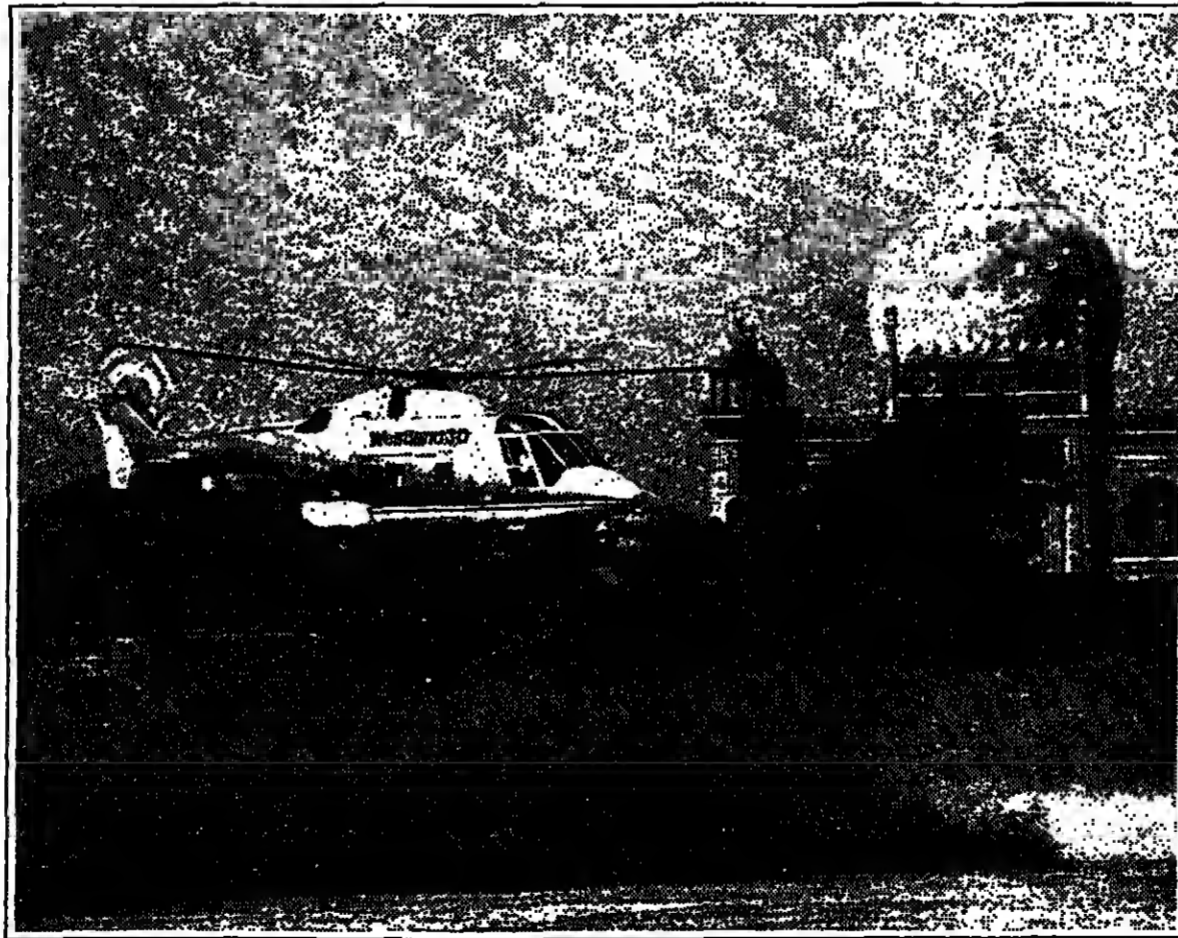
To call the Westland 30 a jewel is no mere flight of fancy. It is quite simply the finest, most versatile helicopter in its class. It has been highly successful in the UK. It's now making inroads into the notoriously difficult American market. And today, even as you read this, it is the subject of intensive negotiations with the Indian government as well as many other customers throughout the world.

It's another jewel in the Westland crown. But only one of many.

EH101 The world's newest helicopter being developed by Agusta of Italy and Westland of Great Britain—backed by both governments with both military and civil versions in its first generation.

LYNX 3 An effective, heavily armed multi-mission helicopter for maritime and army roles—as an anti-submarine helicopter packing a heavy punch against surface ships, the battle proven Lynx can operate from small ships in the roughest weather, day or night. In the army role as a dedicated tank fighter Lynx is one of the most heavily armed helicopters in the Western world.

SEA KING Versatile, capable and effective, bought by nine countries, flown in many different roles and equipped with the most advanced



anti-submarine weapon system. **A20** Our new A20 trainer aircraft, a joint venture with the Australian Aircraft Corporation, is the only turbo-prop trainer specifically designed to fulfil the needs of the world's Air Forces, well into the 1990s and beyond. **API-88** In the civil field, the Westland API-88 can carry up to 100 passengers in air conditioned comfort, and is already winning export orders for Britain.

BH.7 Since building the world's first hovercraft, Westland have continued developing air cushion transport. The BH.7 military hovercraft brings a new level of mobility and speed to the naval transport and fighting ability. And as a minesweeper, it is invulnerable and unbeatable.

LONG LIFE HELICOPTER BLADES A major advance in international helicopter technology, Westland designed helicopter blades

in composite materials are long-lived, need no maintenance, reduce operating costs and are available now for the Sea-King and S61 range of helicopters.

WESTLAND TECHNOLOGIES

Normalair-Garrett, the heart of Westland Technologies is at the forefront of systems technology and has scored major successes in the USA—with the miniature digital data recorder on the F-18 fighter and OBOGS—selected for the B1B bomber to provide a continuous supply of oxygen for the crew without any storage on board—no heavy bottles, no dangerous liquid oxygen.

THE FUTURE We're working hard at Westland on products of the future—helicopters, hovercraft, advanced systems, all of which meet the world market for advanced transportation and systems. And we're constantly developing and improving our current range of products. It's the kind of constant hard work that has built Westland into the internationally known British company it is today. And the kind of hard work that will bring in the glittering prizes of tomorrow.

Westland plc

Yeovil, England

AEROSPACE 2

Better times lie ahead as orders pick up

Civil airliners

MICHAEL DONNE

OVER RECENT months there have been encouraging signs that the world's airliner manufacturers may be heading for better times, and that the long climb out of the trough of recession could be under way. Boeing, the world's biggest builder of jetliners, has reported sales in the first six months of this year of 83 aircraft (of which no fewer than 53 have been for its short-to-medium range 737-300 advanced aircraft), compared with only 30 in the first half of 1993.

Both Airbus Industrie in Europe and McDonnell Douglas in the U.S. have also done much better than last year, with new orders flowing in for A-310s and the new A-320 for Airbus, and a steady demand for the MD-80 series for McDonnell Douglas.

One significant indication that the world's airliner manufacturing business is on the verge of an upturn is that sales of secondhand aircraft have increased substantially in recent months, and the big surplus of such aircraft that became a feature of the recession is now being substantially reduced.

Large wide-bodied jets secondhand are difficult to get. Although there are a number of "white-tails"—new unsold wide-bodies—held by such manufacturers as Airbus Industrie and Boeing, the builders do not anticipate too much difficulty in disposing of them as the airlines' own condition improves, generating a demand for equipment.

The makers have always recognised that the glut of used aircraft would have to diminish substantially before sales of new aircraft began to rise, and the fact that both situations are now emerging indicates that better times may well be on the way, though no one is yet prepared to forecast a boom in sales of new aircraft. The recovery will be gradual, but nonetheless real.

Factors behind this improvement in the manufacturers' situation include not only increasing traffic stemming from improving economic conditions, but also tighter control of their

own yields by the airlines, following their severe retrenchment measures of the past few years.

Airline managements are now better equipped to understand and cope with external economic influences, and can react more swiftly. At the same time, fuel prices (one of the biggest single cost items in the airlines' balance sheet) have stabilised, and in some cases have actually declined, and this, coupled with the internal retrenchment undertaken by many airlines, has also improved their financial situation.

As a result, many airlines are now able to focus attention on fleet requirements and long-term re-equipment strategy. At the same time, the deadlines for compliance with new government-imposed noise regulations, coupled with the ageing of existing fleets, are obliging managements to think more urgently of fleet procurement.

Airbus Industrie believes that between now and 2002 there will be a world market for nearly 8,000 new airliners of all kinds, worth close to \$450bn.

Airbus believes that of this market, more than 2,500 of the aircraft required will be in the "single-aisle" category, such as Boeing 737s, McDonnell Douglas MD-80s and Airbus A-320s, worth about \$88bn; about 3,154 aircraft will be in the short-to-medium range twin-aisle category, such as Airbus A-300s and Boeing 767s, worth in all about \$226bn; while the rest, about 1,150 aircraft, will be in the long-range category, worth about \$127bn.

Strong

Airbus believes that it can capture about 20 per cent (\$18bn) of the single-aisle business; about 33 per cent (\$75bn) of the short-to-medium range twin-aisle business; and about 17 per cent (\$22bn) of the long-range aircraft business—a collective total for Airbus of about \$115bn.

Airbus now believes it has a strong product line with which to win this business, ranging from the big, 200- to 250-seat A-300 series in various versions, through the 200-/220-seat A-310, also available in different versions, to the smaller, 150-seat A-320, now under development



The world's major aerospace manufacturers are looking ahead to a new era as the recession passes.

for service from spring 1995. Total Airbus sales by mid-summer had reached 406 aircraft, for 49 operators, with close to 270 aircraft delivered. Current production of all versions of the Airbus is running at 44 aircraft a year, but because of the shortage of new orders last year, when the production rate is being cut back to 30 aircraft for 1995 and 1996.

If, as Airbus believes, demand picks up, the group will be able to increase production slowly by one aircraft a month, giving a total of 46 to 48 aircraft a year in 1995-96.

Airbus is putting particular emphasis on the A-320, which it believes will eventually be one of the world's best-selling airliners. Airbus believes that it is well ahead of the competition in building an all-new technology airliner for the late 1990s, against the introduction of derivatives by Boeing and McDonnell Douglas, although it

is well aware that both its rivals can still announce new aircraft and, with their great manufacturing strengths and skills, can perhaps catch the A-320 up.

In the meantime, however, availability of the A-320 by 1995 is still regarded by many airlines as a long time off, and Airbus expects to lose some orders to Boeing and McDonnell Douglas because airlines, for noise and fleet age reasons, cannot wait that long. But it also believes that, sooner or later, many of those same airlines will have to turn back to the A-320 in order to be competitive, especially if the rival makers do not produce their own new designs.

Airbus is also now studying another potential addition to its fleet in the shape of the TA-11, a four-engine, long-range aircraft. The aim is to design an airliner that can fly very long distances, on routes where the traffic available does not justify using a bigger aircraft such as a Boeing 747 Jumbo jet.

Airbus believes that the TA-11, powered by the new international V-2500 engine, could offer seat-mile costs equal to or cheaper than those of the Boeing 747. Because of this, the TA-11, says Airbus, is now being positively received by the airlines. Also, the 747 price is now so high—around \$100m per aircraft—that many airlines cannot afford such an aircraft.

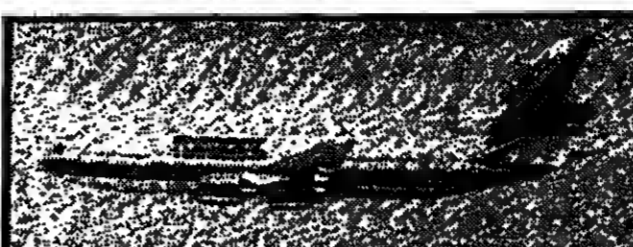
Airbus says that the TA-11, as now envisaged would be able to fly more than 5,400 nautical miles non-stop (that is, Paris-Rio de Janeiro, or Frankfurt-Tokyo), while an extra long-range version could have 6,800 nautical miles non-stop range.

As yet, Airbus has not approached governments regarding finance for such a venture, recognising that it must first return some substantial sales and at least the possibility of profits on the A-320 before seeking further to enlarge the Airbus stable. But by the mid to late 1990s, it feels it will have generated enough orders for the A-320 to prove the success of that venture, to enable it to talk seriously to governments on TA-11 funding.

Airbus is interested in wider international collaboration on this venture, and has been discussing the possibility of the



The Series 300 is Boeing's latest version of the twin-engine 737 short-to-medium haul jet airliner, now Boeing's best-selling jet. The aircraft are seen on the production line at the company's Renton, Seattle, factory.



McDonnell Douglas of the U.S. is trying to woo new airline customers for the latest version of its DC-10 long-range tri-jet airliner, called the MD-XXX, which will use improved engines and many other new technological features.

Japanese aerospace industry taking a share in it. Boeing, the arch-rival to Airbus, also believes that, notwithstanding the difficulties of the past few years, the long-term outlook for the airliner manufacturers remains good, although it has scaled down its forecasts a little. Boeing suggests that, over the period from 1984 to 1996, there will be a new market for airliners worth \$151bn (of which \$91bn will be accounted for by growth, and \$60bn will be accounted for by replacement of existing ageing fleets).

If the value of orders already on hand is also taken into account worldwide, the total value of deliveries between now and 1995 is expected to amount to

of the world, the Far East will have a growing share, of about 17.8 per cent and Europe about 20.6 per cent.

Boeing, while pressing ahead strongly with its own studies into a prospective 150-seater into a prospective 150-seater type aircraft in the shape of the "7 Dash 7", is still watching the market before committing itself to any new programme. It is also keeping alive its studies into new versions of the 737, and believes that the latest model, the 737-300, already capable of seating up to about 140 passengers, could be further developed into a 150-seater if the market required.

These further improvements could take the form of either a new wing or new engines (probably the International Aero-Engines V-2500), or both. But the existing 737-300 is still selling so well—that some of the A-320's market—that Boeing is reluctant to push into a new aircraft.

Boeing also believes that it could meet prospective 150-plus seat requirements with a possible derivative of the 737, with a smaller fuselage to seat about 165-170 passengers, again using the V-2500 engine. The company believes that there is currently more market interest in such an aircraft than in any prospective 150-seater.

Major customers

Before Boeing launches either a modified 737, or a "7 Dash 7", or even a new version of the Boeing 737, it would need a spread of two to three major customers, who would be likely between them to need upwards of 100 aircraft over the years ahead. On that sort of base, Boeing believes, a long-term market could be built.

So far as the V-2500 engine is concerned, Boeing would require a smaller thrust than currently offered (around 22,000 lb instead of about 23,000-25,000 lb), and is discussing that possibility with IAE.

The medium-to-long range twin-engine 767 also continues to sell, and there is especially strong interest in the longer-range versions of that aircraft, among airlines who want 200-250 seats and long range but

are not happy with the Began, 400-plus seat Jumbo jet.

Boeing believes that it has the potential to give the 767 up to 6,000 nautical miles range, which would make it a highly suitable aircraft for long over-water operations, using either the Pratt and Whitney PW-4096 engine or the General Electric CF6-80C2.

But one of Boeing's favourite programmes at present, is a further development of the stretched upper deck 747 Jumbo jet, the Advanced Series 300 model. By making extensive use of the new, high-strength, lightweight aluminium-lithium, and by refurbishing the interior and using new engines (either the high-thrust Pratt and Whitney PW-4096 or General Electric CF6-80C2), Boeing believes it can extend the range of the 747-300 by as much as another 1,000 nautical miles. This would make it possible to fly the aircraft non-stop between Singapore and London, or more than 6,000 nautical miles. The company is discussing this version of the 747 with several airlines, and hopes to announce an order by this autumn.

McDonnell Douglas, the third of the "big three" commercial jet airliner manufacturers, is doing well with its MD-80 series of twin-jet aircraft. As of mid-July, it had delivered 107 of these aircraft, and had on the books a backlog of 126 more aircraft firmly ordered, with options or leases for 180.

The company is looking ahead to new markets, and is discussing with airlines the MD-XXX, a developed version of the DC-10 tri-jet, which would have long range and carry about 300 passengers; using the new international V-2500 engine, it would thus fit into a market below the Boeing 747 Jumbo.

In the twin-engine MD-80 series itself, the company is offering various versions, ranging from the 130-seat MD-87, through to the 170-185 seat MD-88. Although it has studied new 150-seater type designs, the company believes that its MD-80 series more than adequately responds to the market challenge.

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COMMERCIAL AVIATION 1985-1994

Aircraft type	U.S.		Non-U.S.		World	
	Units	\$ bn	Units	\$ bn		
Long range twin aisle	75	6.5	475	44.0	550	50.5
Med-short range twin aisle	375	19.0	675	35.5	1,050	54.5
Med-short range single aisle	1,100	32.5	1,500	40.5	2,600	73.0
Total market	1,550	58.0	2,650	120.0	4,200	178.0

TURBINE ENGINES AND SPARE PARTS

Aircraft type	U.S.		Non-U.S.		World	
	Units	\$ bn	Units	\$ bn		
Long range	350	4.5	2,400	26.5	2,750	31.0
Med-short range twin aisle	1,800	7.5	1,800	12.0	3,600	19.5
Med-short range single aisle	2,800	12.0	4,050	14.5	6,850	26.5
Total market	4,950	24.0	8,250	47.0	13,200	77.0

Source: Pratt & Whitney Aircraft, U.S.

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AEROSPACE 3

Strong demand expected to continue



The British Aerospace Nimrod Airborne Early Warning aircraft Mark 3, now under development, showing the extensive modifications to the nose and tail to house the complex radar systems of this aircraft.



The Swiss-built Pilatus PC-9 basic trainer recently made its maiden flight at the company's Stans, Lucerne, airfield. The PC-9 is one of the four short-listed candidates for selection for the RAF's new basic trainer, to replace ageing Jet Provosts.

Military aircraft

MICHAEL DONNE

THE continued strong demand for military aeroplanes of all types, especially fighter tactical combat aircraft, has bolstered the revenues of many aerospace companies whose civil aircraft activities have suffered severely from the ravages of the recession.

Most of the major military aircraft manufacturers agree—although their estimates vary—that this vigorous demand is likely to continue through the rest of the century as more and more countries seek new combat aircraft for their air forces or, especially in the developing countries, build them up.

British Aerospace is a major builder of military aeroplanes; the Tornado multi-role combat aircraft, the Jaguar jet strike-trainer, the Harrier vertical take-off fighter, the Hawk trainer and light combat aircraft, and the Nimrod maritime reconnaissance and early-warning aircraft developed from Britain's first jet airliner, the Comet.

Last year BAE's turnover in military aircraft and support services amounted to over £1bn,

against £435m from civil aircraft—a clear indication of the way in which military activities predominate, at least for the time being.

BAE's current forecast is that between now and the year 2000, some \$800bn will be spent on military aircraft world-wide outside the Soviet bloc and China, about 40 per cent of this being spent in the U.S. The major share of the total market, in terms of cost, will be represented by combat aircraft of all types, of which some 14,000 will be delivered.

The trainer market will account for another 6,500 aircraft, the airborne early-warning demand for about 200 aircraft, the maritime reconnaissance and anti-submarine warfare roles for about 650, and transport aircraft from the smallest liaison types up to the big freighters, for about 3,000 aircraft.

Pratt and Whitney of the U.S. is the world's highest aerospace builder, estimates the military market over the next decade alone at about \$320bn (measured in 1985 dollars), an increase of some 55 per cent over the previous 10-year period. Of this total, some 60 per cent will be for the U.S. armed forces and the rest for the remaining free world.

In terms of numbers, Pratt and Whitney sees this as 20,500 aircraft, of which about 210 (worth about \$44bn) will be long-range strategic types such as the U.S. Rockwell B-1B supersonic bomber, 9,550 (worth \$185bn) as tactical combat aircraft of all kinds; and about 600 transport aircraft (worth \$36bn).

The remaining 10,440 (worth \$88bn) cover a wide variety of types such as surveillance, reconnaissance, liaison, communications, airborne early-warning, airborne command post, evacuation and a host of other roles.

The engines sector of this vast market is assessed at 46,000 units, worth about \$75bn, or about 35 per cent higher than in the previous 10-year period. The growth in aircraft sales is larger than the growth in engine sales because of the increasingly greater cost of the advanced avionics and weapons systems fitted to modern military aircraft.

By far the most significant development in military aviation in Western Europe so far this year has been the agreement by the Defence Ministers of the UK, France, West Germany, Italy and Spain to proceed to the detailed feasibility

study stage of a new Euro-fighter to replace ageing Jaguars in the Royal Air Force and French air force, Phantoms in the Luftwaffe, and Lockheed F-104s in the Italian air force.

These studies will concentrate on how best to harmonise the various ideas held in the five countries on the type of new fighter required, together with its power-unit and the formulation of work and cost-sharing plans. By next March the Defence Ministers will meet again in Rome to take a final decision whether to go ahead with the venture, dubbed the "European Fighter Aircraft" or EFA but more commonly named the Eurofighter.

Total of 800

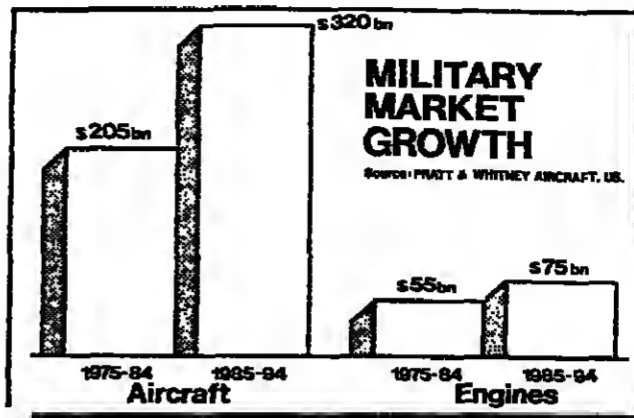
This aircraft is needed by the early 1990s and an eventual total of more than 800 aircraft is envisaged, with exports also expected. Current ideas envisage a multi-role aircraft, with both ground attack and air superiority mission capacity, powered by an entirely new engine to be developed jointly by the partners but probably based on both the French Snecma M-88 concept and the Turbo-Union RB-199 engine that currently powers the Tornado.

This programme will involve Rolls-Royce, Snecma, Fiat Aviazione di Italy and Motoren und Turbinen Union of West Germany. The airframe will involve British Aerospace, Messerschmitt-Bölkow-Blom, Dassault-Breguet, Aeritalia of Italy and Casa of Spain.

The work-share will probably be about 25 per cent each for the UK, West Germany and France, with Italy and Spain dividing the rest. Cost sharing will probably be in the same proportions.

There are still many other questions to be settled about the Eurofighter. Apart from the detailed issues of how the overall programme is to be managed—whether by a joint consortium of the Panavia type, as in the Tornado programme, or by some other organisation specially set up for the task—there is still the problem of determining which country does what in the actual design and development and whether there should be one "design leader" or a committee system overseeing the venture.

Views on these matters are still sharply divided among the participants, and it is to settle these issues that the Defence Ministers have given the aerospace companies (and the Air Staffs) of the five countries until next March to try to resolve them.



MILITARY AVIATION 1985-94

Table with columns for Aircraft type (Strategic, Tactical, Transport, Other), U.S. (Units, \$bn), Non-U.S. (Units, \$bn), and World (Units, \$bn). Total market values are \$8,860, 204, 11,940, 116, 20,800, 320.

TURBINE ENGINES AND SPARES

Table with columns for Aircraft type (Strategic, Tactical, Transport, Other), U.S. (Units, \$bn), Non-U.S. (Units, \$bn), and World (Units, \$bn). Total market values are 21,800, 46, 24,200, 29, 46,000, 75.

years on research, development and initial procurement of an advanced tactical combat aircraft for the mid to late 1990s, a programme in which most of the leading military aircraft companies are competing.

Several other advanced military aircraft research programmes are under way in the U.S. These include the Grumman X-29A "forward-swept wing demonstrator," designed to show the benefits of sweeping wings forward instead of backwards so as to create a new generation of tactical combat aircraft that could be smaller, lighter, less costly and more efficient than existing fighters.

All of the British Aerospace military aircraft programmes are running strongly. All the planned 805 Tornado multi-role combat aircraft have been ordered and so far well over 350 have been delivered. It is possible that a further batch of about 40 Tornado aircraft may be ordered to replace those lost through attrition. Some major export orders are being actively sought, especially in the Middle East, where Saudi Arabia has expressed interest.

For the Jaguar, a total of 573 have been ordered so far and about 450 have been delivered. Further export orders are being sought and it seems likely that the Jaguar production line will be busy until 1986 at least.

Work is also well under way on the Hawk trainer/light combat aircraft for both home and export, while BAE is now developing a new single-seat version of this aircraft for the many foreign air forces who need a relatively low-cost but efficient tactical combat aircraft.

Work is also well advanced on the advanced Harrier GR Mark V for the RAF and the AV-8B Harrier II for the U.S. Marine Corps, in conjunction with McDonnell Douglas of the U.S. A total of over 400 of these Harriers are envisaged for the U.S., the UK, and the Spanish Navy.

Also looking to the future, McDonnell Douglas, in collaboration with British Aerospace, is studying the possibility of developing a supersonic vertical and short take-off aircraft, derived from the Harrier. As part of these studies, Rolls-Royce has also been studying "plenum chamber burning" (PCB), a method of boosting the thrust of the current Pegasus engine to the high power that supersonic V/STOL aircraft would need.

Orders pick up

CONTINUED FROM PREVIOUS PAGE

lengths in this area offered so far by the A-320 and Boeing 737-300.

Especially, the 155-seater tri-jet of the MD-81, (capable of 1,652 nautical miles range), the MD-82 (2,047 nautical miles) and the MD-83 (just over 2,500 nautical miles), collectively in McDonnell Douglas's view offer the airlines as wide a variety of types as they could need in the broad 150-seater category.

Progressive improvements planned through the 1990s will in the company's view keep this family of short to medium range jets fully up to the competition. The smaller MD-87 is intended to meet the requirements of smaller regional airlines who do not want a 150-seater, while the MD-88 offers

airlines a larger aircraft that can compete on routes where a 150-seater would be too small.

Fokker, of Holland, which over the past few years has achieved considerable success worldwide with the F-28 twin-engine jet Fellowship, and the twin turbo-prop F-27 Friendship airliners, has now launched their successors onto the world market—places, the F-100 twin-jet and the F-50 twin turbo-prop.

Both these aircraft make considerable use of advanced technology, and have substantially improved noise levels and fuel efficiencies over their predecessors—especially the F-100 which will use the new Rolls-Royce Tay jet engine.

As their designations imply, these aircraft will seat about

100 and 50 passengers respectively. The F-100 is aimed at medium range routes of lower traffic density than those for which the bigger Boeing 737s and MD-80s are available, and Fokker believes a market for several hundred F-100s is available through the rest of this century.

In the turbo-prop field, Fokker believes a world demand up to the end of this century of around 1,000 is likely for the 50-seat turbo-prop airliner.

Most of this market will be for the replacement of existing ageing turbo-props, and Fokker believes that on the basis of the past sales of several hundreds of F-27s, it can secure at least a market for 200 F-50s, although it will be aiming for more.

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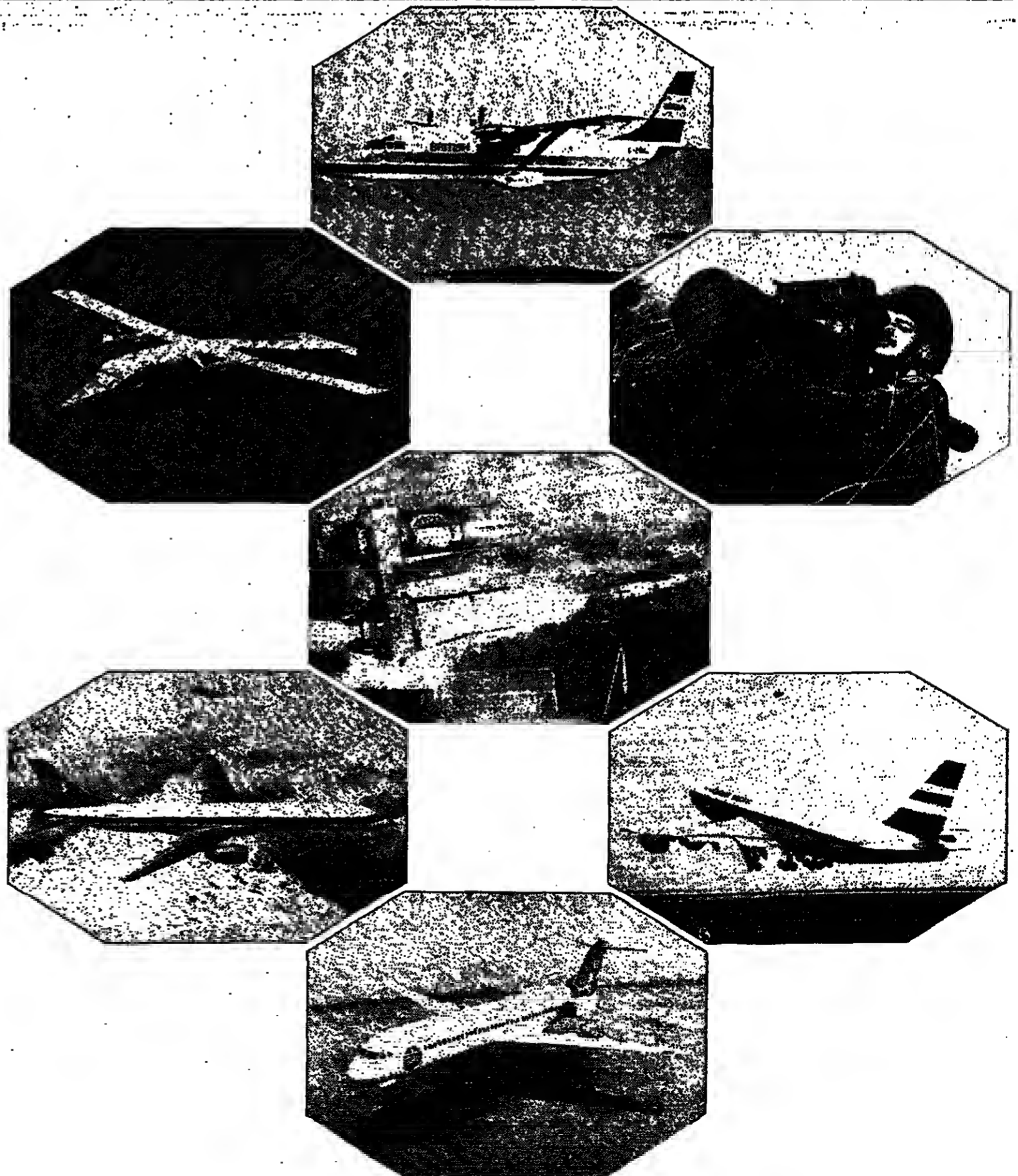
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AEROSPACE 4

Spearhead of advanced materials technology

New Materials

MICHAEL DONNE

THE AEROSPACE industry has always been one of the major spearheads for the development of advanced materials technology.

The search for higher strength with lower weight and longer component life at reasonable cost has dominated aerospace development for many years across the entire spectrum of civil and military aircraft and engines, guided weapons and, more recently, spacecraft.

As Sir Frederick Page, the former chairman and chief executive of the Aircraft Group of British Aerospace, pointed out in a recent lecture on "Future Developments in Technology to the Year 2000," the long-standing dominance of aluminium alloys and steel was challenged from the 1950s onwards by the emergence of titanium and composite materials of various kinds.

Today, "we are in the midst of rapid development of structural materials and methods of manufacture," Sir Frederick said.

"Exactly where it will lead is difficult to say, but if the existing weight of the aluminium used in, say, a jet airliner, is 160,000 lb, the use of aluminium-lithium could reduce it by 14,000 lb, which saving could pay for itself either increased payloads (more passengers) or more fuel (giving longer ranges). Aluminium-lithium so used could cut seat-costs per mile by as much as 6 per cent. One US calculation is that an airline with a fleet of 20 or so long-range transport aircraft using aluminium-lithium structure parts could save as much as \$40m a year on fuel costs of \$2 a gallon. This may be an extravagant estimate, since no one yet really knows precisely what the savings really could or would be, but it serves to show how seriously aluminium-lithium is being regarded.

In the UK, British Aerospace has been studying the potential uses of the material at Filton, near Bristol, and Warton, Lancashire, undertaking machining, forming and other tests. BAE expects to employ the new material initially in non-stress bearing parts of aircraft, such as wing-slats and flaps, building up, as knowledge of the material's stress-bearing qualities develops, to its use in other more primary structures. This means that aluminium-lithium could be used in parts of the projected new European Fighter Aircraft for the 1990s, or even in parts of the A-320 European Airbus.

Airbus Industrie itself is making an extensive study of the possible use of aluminium-lithium in the A-320, perhaps even retrofitting to its other aircraft, the A-300 and A-310,

mainly used in batteries and also has applications in atomic energy. Once alloyed with aluminium, however, and solidified, lithium becomes stable and non-reactive, making it possible to use in a wider range of products.

The benefits of aluminium-lithium lie in the fact that, despite its initial higher cost over existing aluminium alloys (although this is expected to be reduced in time), it is highly corrosion-resistant, with a substantial saving in weight while possessing a much higher degree of strength and stiffness. As a result, the development of aluminium-lithium is regarded as the most significant innovation in aircraft construction materials for many years, in spite of the development of carbon fibre and other composites.

Its benefits in aerospace already appear considerable. The lighter weight (up to 6 per cent when used as a replacement material in existing load-bearing aerospace parts, such as wing flaps, slats and doors, and up to 20 per cent when it is used as an integral load-bearing part of an airframe design from the start), can be used to give enhanced range and payload performance in an aircraft.

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Sikorsky Aircraft of the U.S. is now building a new helicopter, making far more extensive use of advanced composite materials than ever before under the U.S. Army's Advanced Composite Aircraft Programme (ACAP). The helicopter features extensive use of graphite/epoxy and Dupont's Kevlar/epoxy materials, yielding a 24 per cent saving in weight compared with an equivalent aluminium airframe.

so as to improve progressively their range-payload performance.

In the U.S., Boeing has also done much work on the new material, and is enthusiastic about its long-term potential. Boeing believes it could be used in new aircraft entering service around 1988, which means that it could be used in any new airliner Boeing might develop to compete with the Airbus A-320.

At this stage, quantity manufacture of the material is at a relatively early stage. In the UK, British Alcoa, which has made a major contribution to bringing the material from the laboratory to the production stage, is now building a major new production plant at its Kites Green, Birmingham, factory, which it is hoped to have operational later this year.

In the U.S., Alcoa, whose investment in Alitihale now amounts to more than \$50m, says the material will become commercially available in 1985. Alcoa plans to offer it in three basic forms—plate, sheet and forgings—from plants in Cleveland, Ohio; Davenport, Iowa; Lafayette, Indiana; and Los Angeles, California.

It will be up to the aerospace manufacturers to work out their likely demands for the material to enable the basic material producers to gauge the production quantities required. So far, the aerospace builders have been careful in their

approach to the material, satisfying themselves as to its structural and manufacturing integrity, such as its suitability for being shaped into the complex parts that aircraft require, before committing themselves extensively to its use.

Demand is expected to increase significantly over the next few years, however, so that by the end of this decade it may be used almost as extensively in aircraft as titanium is today.

Meanwhile, the aerospace industry continues to make increasing use of other alloys and also of composite materials of all kinds. In composites the search for new mixes of materials is spending and large sums are spent on composites research.

Labour saving

In the U.S. Sikorsky has substantially expanded the use of materials such as graphite, fibre-glass and Kevlar/epoxy composites. Among current activities is the development of a composite-material rear fuselage for the H-60 helicopter, under a U.S. Air Force contract.

With conventional metal construction, such a component is highly labour intensive, with 856 detailed parts, 75 assemblies and 13,600 fasteners. Using composite materials, the component is 17 per cent lighter, has only 104 detailed parts, 10 assemblies and 1,700 fasteners.

The company is also responsible for the U.S. Army's S-75 Advanced Composite Aircraft Programme, a venture designed to produce the world's first composite-airframe helicopter.

The ACAP venture has been aimed at producing and evaluating an airframe that will achieve a 22 per cent saving in weight, and a cost saving of 17 per cent over conventional metal airframes, by making extensive use of Kevlar, graphite, fibre-glass and other composites.

In fact, the ACAP has bettered these figures, with a 24 per cent weight saving and a 23 per cent cost saving, as well as substantial improvements in reliability and maintainability.

Also in the U.S., work has been under way for some time on the development of an all-composite business aircraft, the twin turbo-shaft Lear Fan. This venture has been delayed because of difficulties encountered in the certification programme. It is still intended to put the aircraft into quantity production, however, with assembly of the aircraft in Northern Ireland, perhaps starting in the New Year.

Meanwhile, activity at the Northern Ireland plant has been substantially slowed, and most of the labour force has been, or is being, laid off. In the UK, Rolls-Royce has for many years been a pioneer of new methods and the use of new materials in aero-engine manufacture. The constant

search for higher efficiencies and performance throws extra thermal and mechanical stresses on the working parts of a gas turbine.

To counter these effects, and extend the durability of engine components, Rolls-Royce has initiated the production of several new high-temperature alloys. Much work has also been carried out on reducing weight of some engine parts under low stress by replacing alloy components with others made from carbon or glass-fibre.

The overall effect of improved materials is to produce a lighter, stronger engine with scope for further advances in performance.

Examples cited by Rolls-Royce include the progressive replacement of steel compressor discs and blades with lighter titanium alloy components. A new alloy, Titanium Ti 55315, permits more extensive use in the hotter parts of an engine, while for even higher-temperature use, a powder material, Antrony, has been developed.

This is a nickel-based superalloy disc material which gives increased strength and temperature resistance, making it possible for turbines to run with higher rim speeds and offering longer component lives. Further advantages of this powder metallurgy include fewer steps in the manufacturing process, with potential reductions in costs, waste



New technology on the flight deck

The new generation of jet airliners either now under development or entering service, such as the Airbus A-310 and A-300-600, feature new concepts in flight technology, whereby extensive use is made of "push-button" and cathode-ray tube electronic displays, enabling these aircraft to be flown safely and easily with two-man crews. On the Airbus cockpits (shown above), the cathode ray tubes are used to display flight and navigation information, together with the electronic monitoring of aircraft systems and the presentation of warning information on malfunctions easing the pilots' workload and making the flight deck a more congenial place.

material and machining time. Rolls-Royce has also developed a laminate material named Transply which considerably improves on conventional materials used in the very hot parts of a gas turbine, where flame temperatures of about 2,000 degrees Centigrade are common. The materials used in the combustion chambers must therefore be capable of withstanding the extremes of temperature and pressure.

Ceramic coatings can help in this respect, but it is still necessary to keep the metal temperatures as low as possible. Transply has been found highly beneficial in this respect when used in combustor casings. Transply is a nickel alloy sandwich with "transpiration" passages built into it to allow the free passage of cooling air.

Combustion cooling air requirements are consequently halved, making more air available for mixing with the fuel and for emission control, giving a cleaner and more durable component. With Transply fewer cooling rings are needed, therefore saving in both cost and weight.

Rolls-Royce has also been working extensively on the use of advanced carbon composites which have the advantages of higher specific strength and stiffness than conventional light alloys. Citing examples, Rolls-Royce

says that these advanced carbon composites are tolerant of temperatures up to 300 degrees Centigrade. They offer weight savings of up to 25 per cent over light alloys, with no loss of integrity. On the RB-211-524 turbo-jet it adds up to a total weight saving of over 370 lb per unit. On a Boeing 747 four-engine jumbo jet this allows seven more passengers to be carried.

Though the use of carbon composites in engines has been confined so far to highly loaded structures, much valuable experience has been gained from the aspects of weight-saving, mechanical reliability and manufacturing costs.

Programmes are in hand at Rolls-Royce to extend the application of composite materials and to exploit the higher temperature composites now becoming available.

British Aerospace has been a leading exponent of the development of carbon fibres and other composite materials, especially for military aircraft. BAE has been working on composites for nearly 20 years, and apart from developing composite material parts for the Jaguar and the Foxhunter multi-role combat aircraft, considerable effort has been, and is being, put into composite components for the Experimental Aircraft Programme (EAP), the proposed forerunner of an eventual European Fighter Aircraft (EFA) programme.

Computers aid design and production methods

New Techniques

LYNTON HILAN

COMPETITIVE pressures and rapid technical advances have combined to accelerate the introduction of new design and manufacturing methods by world aerospace companies.

The advances in aerospace design capacity are based on computer systems and increasingly small, rapid and reliable micro-electronic circuits. In manufacturing techniques the main advances have been in the growing use of automated and flexible production systems, often related to the use of new materials such as composites, including carbon fibre.

In high-precision manufacturing, companies are making greater use of lasers, for drilling and cutting. Where lightweight, high strength and structural integrity are required, as in jet engine parts, new techniques include the growth of single crystal metallic parts and the use of "metallic sandwich" components.

In aerospace design the technology of computer-aided design (CAD) is at the forefront of computer-based techniques. This approach in design is set to become a standard technique in much of the industry.

One of the greatest advances made possible through CAD is the elimination or reduction of the need to design, develop and produce prototype aircraft, missiles, radar systems and airborne avionics ahead of full production. The British Aerospace Hawk advanced trainer aircraft is a recent example of an aircraft that did not go through the prototype design stage.

The first aircraft to fly was the one first designed and the same machine that is in quantity production for the Royal Air Force.

The same is true of other aerospace projects, especially in avionics, where electronic circuit designs can be tried and tested with computer-aided design on a screen before money is spent on producing

the hardware itself. Cossor Electronics, the UK defence equipment company that is part of the U.S. Raytheon group, uses CAD techniques as standard for the design of its radar and other electronic products.

Most aerospace products can now be designed, if the manufacturers and customers choose, on cathode ray tube displays. Detailed mathematical modelling can be used, allowing the designers to amend and alter their ideas to take into account a range of variables, including the needs of various customers, different national statutory requirements and different operational and environment conditions.

The increases in the computational speeds of microchips have helped designers in aerospace, but much greater speeds are likely to be required before aeronautical engineers are able to design airframes in their entirety.

Computer design techniques pioneered by British Aerospace for the design of wings, including its work as the partner in Airbus Industrie responsible for wing design and production, have enabled the company to produce relatively thick wings with reduced sweep to achieve high subsonic speeds and improved lift coefficients. Reduced weight and enlarged fuel volumes can be achieved.

Integrated system

Linked to computer-aided design is computer-aided manufacture (CAM). Rolls-Royce is developing computer aids to help the design and detailed drawing of components as part of an integrated design and manufacturing system.

This CAD/CAM system ultimately will be capable of processing information from design and detailed engineering work and then planning the entire manufacturing sequence. This will include operations from the production of numerical tapes for controlling the machine tools to time and cost estimating.

Rolls-Royce uses the TACITUS "turbine aerodynamic cooling interactive terminal user sys-

tem" which assists the design of turbine blades. It has reduced the time taken to design a cooled turbine blade aerofoil by 90 per cent, the company claims.

The development of mathematical models to cut the time spent on the three-dimensional analysis of parts will be possible with the introduction by Rolls-Royce of the numerical geometry system (NGS).

Rolls-Royce is a world leader in the development of large fan turbo-jets, which get three-quarters of their thrust from air by-passing the hot centre of an engine. The design of the fan is crucial and by removing the "smoother," which links each fan blade with the next blade, the efficiency of the fan can be improved, though there is a penalty because the blades become less rigid.

Wider blades can solve the problem, but they are heavier. Rolls-Royce solved the problem, but they are blade fabricated as a "sandwich" from titanium sheet with a light titanium honeycomb structure in between.

These wider blades are 30 per cent fewer than in a conventionally produced fan. Specific fuel consumption with engines such as the Rolls-Royce 535-E4 fitted with the hollow honeycomb blades could be cut by up to 2½ per cent.

The pre-formed titanium panels of each blade are produced by "creep-forming" to the desired aerofoil shape. The inner surfaces are then chemically etched to achieve the required wall section.

A sandwich technique is also used by the company in its "Transply" laminate material for use in engine combustion chambers. Transply is a nickel alloy sandwich with "transpiration passages" to allow cooling air to reach the inner wall of the chamber.

The effect is to halve the requirement for combustion cooling air, leading to greater fuel efficiency.

Advanced techniques to cut costs and further improve efficiency are at the heart of many aerospace manufacturing operations.

Laser beams for welding, hard-coating of materials, metal

cutting and drilling are among the most successful of these advanced techniques. With optical focusing, laser beams can have power densities approaching those of electron beams. With laser hard-coating, a powder is fused to the surface to be hardened by the beam.

This process is fully automated and is used at Rolls-Royce to give high consistency and shorter setting-up times. The technique therefore has advantages for individuals and short product runs.

The Lockheed Missiles and Space company of the U.S. has developed computer techniques for showing how people can be used more effectively in aerospace activities. In particular, the company has developed ADAM and EVE, the "anthropometric design aid mammalian" and the "ergonomic value estimator."

Human element

These are computerised outlines of a man and a woman and show how people co-ordinate with the assembly of Trident nuclear missiles.

The outlines are produced on Lockheed's CADAM, "computer graphics augmented design and manufacturing" monitors.

Of the six fleet ballistic missile versions produced by Lockheed since the 1960s, "Trident II is the first to be designed entirely by CADAM instead of by the drawing board," the company states.

The best feature of CADAM is its ability to help the designer to visualise relationships between design ideas and the "human interface" they require, says Mr Richard Davis, a senior human factors engineer at Lockheed.

Some of the greatest advances in aerospace design and manufacture have been made through improvements in electronic micro-circuits. Designers aim to achieve ever higher speeds and greater computing capacity on still smaller micro-chips.

Defense Department, which has spent \$530m on VHSIC work since its programme began in the fiscal year 1980.

Electronics is the largest single area for the budgeted spending estimates for research, development, test and evaluation by the U.S. Department of the Air Force in the current fiscal year. Electronics accounts for \$466.2m, or 36 per cent of the total \$1,293m technology R and D budget estimates for 1984.

Within this dominant research spending area the work on "very high-speed integrated circuits" accounts for the biggest single allocation in the entire R and D budget.

Spending by the U.S. Department of the Air Force on VHSIC is budgeted to reach a peak in the five-year programme this year with \$125.1m allocated. This is almost 10 per cent of the entire R and D budget and over 25 per cent of the Air Force Department budget on electronics research.

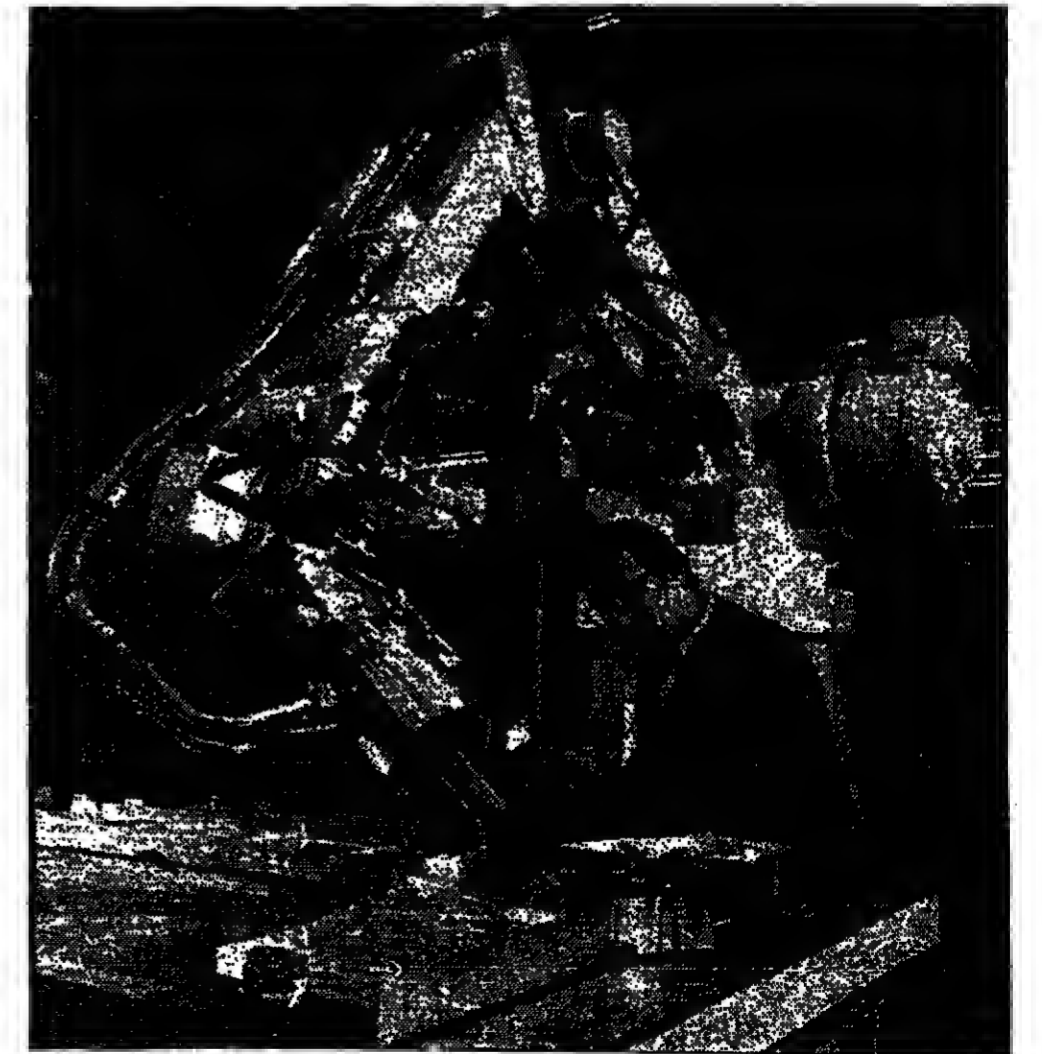
Six U.S. contractors are involved in the programme: Honeywell, IBM, Texas Instruments and teams headed by Hughes Aircraft, TRW and Westinghouse. The contractors in Phase I of the programme have already produced over 1,500 fully functional VHSIC chips.

Phase II proposals are under evaluation, with the six existing contractors bidding, along with a new bidder, AT and T Technologies in partnership with Raytheon and E-Systems.

Very high speed integrated circuits are expected to change radically the design options open to aerospace companies, especially in airborne electronic avionics equipment.

The potential improvement is illustrated by the possibility of one card of VHSIC replacing entire boxes of electronics in aircraft or missiles. Maintenance will be simplified and installation space reduced, with a possible cut of 50 per cent in the total life costs of avionics equipment.

About half of the total cost of the VHSIC programme so far has been spent on work by the six contractors. A further \$60m has been spent on developing advanced lithographic and fabri-



Northrop Corporation of the U.S. has begun operating an articulated-arm robot in the precision removal of sharp edges from aluminium parts for the U.S. Navy's F/A-18 Hornet strike fighter. The machine reduces the man-hours involved in this operation by 40 per cent at Northrop's Machining Centre in Hawthorne, California.

cation techniques. The result is the production of memory chips with almost 500,000 transistors, interconnected on chips less than a third of an inch square.

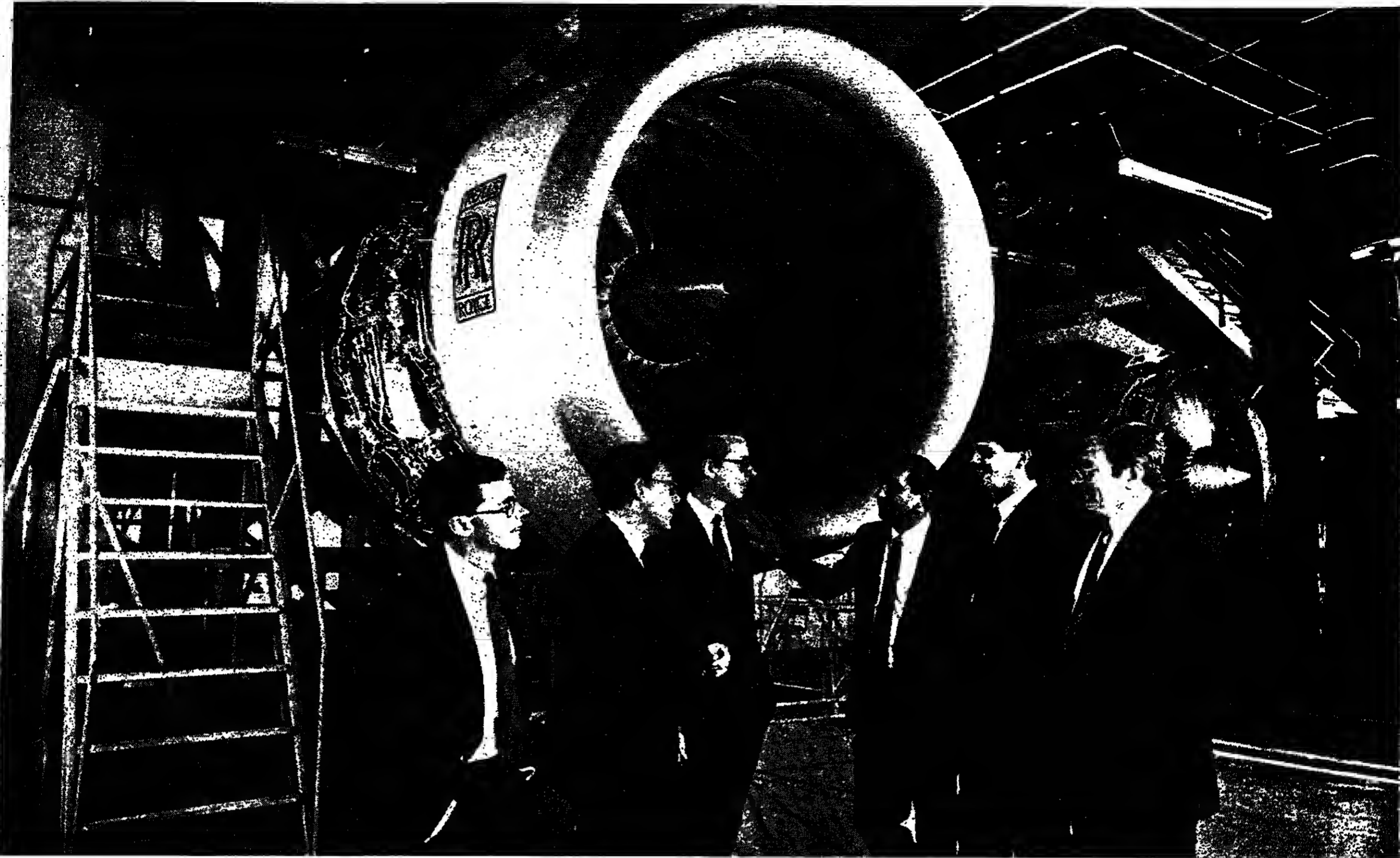
Some of the chips can perform at immense speeds. A chip produced by IBM can carry out 100m multiplications every second. These speeds are likely

to find specialised applications in defence electronics, in radar and image sensor equipment, and in equipment for processing signals from a wide range of sources.

In Britain, British Aerospace Dynamics Group is expanding its production capacity in printed electronic circuit boards. A £1m investment in a production line

at Bristol will enable BAE to pack three times as many components as before on a given area of board.

The line will include an automated flexible manufacturing system and is expected to begin production in August 1985. The "multilayer printed circuit boards" are to be used mainly for BAE guided weapons.



The Chase Partnership at work with Rolls-Royce at Derby, in front of the new RB211-535E4. Shown from left to right: Christopher Rocker, vice president, Country Corporate Manager, Chase UK; Paul Spencer, Group Treasurer, Rolls-Royce; Michael Kruse, vice president, Aerospace Division Executive, Chase New York; David Wicks, Head of Marketing, Rolls-Royce; John Rose, Head of Sales Financing, Rolls-Royce; Geoffrey Boll, vice president, Export Finance, Chase UK.

The Chase Partnership. Working closely with Rolls-Royce Ltd to provide trade finance for aero-engines wherever it is needed around the world.

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AEROSPACE 6

Slow recovery but long-term demand is good

Helicopters

MICHAEL DONNE

OVER THE past two years or so demand for helicopters worldwide has dipped as a result of the sluggishness of commercial needs caused by the economic recession.

Helicopter manufacturers have been sustained by the volume of military business, which has remained at a high level, especially in the U.S. Sikorsky, the world's biggest single manufacturer of helicopters, estimates that during 1983 world-wide helicopter sales amounted to about \$4.5bn. This represented a fall of about 5 per cent over 1982, largely because of poor commercial demand.

Even so, most of the major helicopter manufacturers believe that even if near-term demand is set only for a slow recovery, the long-term demand for helicopters remains good. Both Westland Helicopters of the UK and Sikorsky of the U.S. agree broadly (although their estimates may vary in detail) that annual demand for helicopters of all types will total about 5,000 aircraft a year in the Western World up to the year 2000.

Lower figures

Sikorsky is forecasting that between 1984 and 1993 the total world demand for helicopters of all types is likely to amount to about 21,700, of which military aircraft will account for about 10,200 and the civil market about 11,500, as the accompanying table shows.

These figures are slightly lower than forecasts made by Sikorsky a year ago for the ensuing decade. This reflects a reduction in demand in the light civil sector (for helicopters up to about 7,000 lb gross weight), which has been hardest hit by the recent recession.

Sikorsky believes that the light, single-engine civil helicopter market world-wide will remain depressed as many customers trade-up into the new generation of light twin-engine models.

But Sikorsky also believes that there will be some compensating increase in demand for intermediate and medium-heavy helicopters. This is largely because some major new military helicopter programmes are either now under way or are planned, such as the Anglo-Italian EH-101 Sea King replacement (with also a civil variant) and the Franco-German PAV-2 anti-tank helicopter, which will boost the military helicopter



The Westland Lynx 3 is an anti-armour helicopter, capable of close air support, troop carrying and logistics support, as well as casualty evacuation. It is the latest development by Westland of the long-running Lynx multi-role helicopter line

figures as the decade advances. Even so, the civil market over the next 15 years or so will continue to be strong, as the figures clearly show. Much of the growth will be in the corporate market, with more and more companies, especially in the U.S., taking to helicopters instead of fixed-wing aircraft as they become more affordable and as recognition of their versatility increases.

The civil helicopter market is still maturing. Today's generation of helicopters is significantly better than yesterday's, and tomorrow's generation will be still better—more efficient, more comfortable, faster and safer.

Sikorsky believes that the future ability and willingness of corporate customers, both in the U.S. and elsewhere, to buy helicopters for general business use has been underestimated, and that renewed economic expansion will generate the corporate profits that lead to increased demand for helicopters, as it will for business aviation generally.

New markets are opening in the Third World, especially in Asia, where the executive helicopter market will expand; and Sikorsky is itself making a major attack on overseas military markets, considerably strengthening its international sales staff, and improving its skills in handling the commercial intricacies of the overseas market.

The company has firmly espoused the concept of international collaboration, and one of its recent developments was a collaborative pact with Construcciones Aeronauticas SA (CASA) of Spain, setting up a long-term helicopter manufacturing co-operation programme. The Sikorsky-CASA agreement will enable CASA and Spain to form their own Spanish heli-

copter design and manufacturing base. Initially, CASA will produce major components for the Sikorsky S-70 and H-60 helicopters, with final assembly and flight testing of both types being undertaken in Spain.

The development of additional helicopter marketing in areas of mutual interest is also envisaged and Sikorsky will provide training in the U.S. for CASA employees. In the UK, Westland Helicopters, which is building the W-30 helicopter for both civil and military use, believes that it can sell up to 725 aircraft through to the year 2000; 415 of these will be commercial versions and the remainder military.

As part of its overseas sales campaign with the W-30, Westland has offered the Australian Aircraft Consortium a plan for the manufacture of W-30 aircraft in Australia with sales rights throughout the Far East and South-East Asia, in conjunction with Westland.

Overall plan

This is part of an overall plan by Westland to collaborate with the Australian aircraft industry, which also includes the possible manufacture in the UK of the Australian Wamira II basic fixed-wing trainer if that aircraft is selected by the RAF in its current search for a new trainer to replace its ageing Jet Provosts.

Westland is also seeking extensive overseas markets for its new Lynx 3, the bigger, heavier version of the earlier Lynx multi-role helicopter. Developed as a private venture at a cost of several million pounds, the Lynx 3 has been designed to fill the need for a new generation of battle-tested and naval helicopters on a wide range of roles, including anti-tank and anti-ship attack.

Westland estimates that, outside the U.S., the market for this type of helicopter could exceed 1,000 aircraft, of which it aims to win a substantial share. Lynx 3s cost about £1.8m each, with equipment extra. Westland would need to win orders for between 60 and 70 Lynx 3s in order to break even on the programme.

Markets where Westland is studying possible Lynx 3 sales include Australia, where there is an emerging need for a new naval helicopter, and Belgium, where a new Army helicopter is needed. In both countries, Westland is offering significant industrial offsets in a bid to win the orders.

In both markets, however, Sikorsky of the U.S. is offering considerable competition, while for the longer-term future the forthcoming PAV-2 helicopter from the Franco-German Aerospace-Messerschmitt combine will also be a severe competitor at least in some roles.

Other markets under study by Westland include Brazil, Malaysia, New Zealand, Norway and Pakistan for the naval version of the Lynx 3, and Sweden, Switzerland, Holland and Oman for the Army version.

Other significant developments in the helicopter manufacturing industry over recent months have included the launching of the full-scale development programme of the joint Anglo-Italian (Westland-Agusta) EH-101 medium-weight multi-purpose helicopter. This aircraft is intended in its military version to replace the Sea King anti-submarine warfare helicopters in the Royal Navy and the SH-3D helicopters in the Italian Navy.

A commercial variant is also under development. This is aimed at meeting operators' needs for extensive range (300 miles) and large payloads (up to 30 passengers), not only in offshore oil support but also for such activities as logging, mining and on-shore exploration where the location of support facilities either precludes fixed-wing aircraft operations or makes them difficult.

The first flight of the EH-101 is set for 1986, with first production deliveries from 1989. The venture is being run by EH Industries, jointly owned by Agusta of Italy and Westland Helicopters.

Sales of well over 700 EH-101 aircraft are envisaged up to the end of the century. About 500 could be the commercial model and the rest military. One of the most significant new military helicopter contracts now under study in Western Europe is the provision of a new tactical transport helicopter to replace the RAF's existing Wessex and Puma

helicopters. An eventual order for about 125 aircraft, worth well over £200m, is envisaged. The RAF has already issued an Air Staff Target (AST-404) calling for the manufacturers to respond with proposals.

So far, three major manufacturers have responded—Westland, with a derivative of its W-30; Aerospaiale, with a new version of its Super Puma helicopter; and Sikorsky, which offers a version of its Black Hawk aircraft now used extensively by the U.S. armed forces.

UK production

As with other major new military aircraft contracts, it is expected that, if a foreign-designed aircraft is ultimately selected, the UK Ministry of Defence will require substantial if not entire production in the UK.

Sikorsky has already been discussing this possibility with Short Brothers of Belfast, but no firm agreement has yet materialised. Aerospaiale, if selected, may link with Westland because of those two companies' existing long-standing relationship stemming from the original Anglo-French helicopter package that produced the

Gazelle light helicopter, the Fume tactical transport and the Lynx multi-role aircraft.

Westland is nonetheless pushing its W-30 hard, with a specific variant, the W-30-404, offered to meet the RAF's needs. It is possible, but not yet settled, that whichever aircraft is chosen, that will be required to use the new Rolls-Royce/Turbomeca RTM322 helicopter engine now under development.

A number of major new helicopter development programmes are now under way in the U.S., which may revolutionise the military helicopter market in the years ahead and have an eventual impact also on civil helicopter design. Sikorsky, for example, has a \$77m contract from the National Aeronautics and Space Administration to help test the "X-wing" concept.

The X-wing operates like a standard helicopter rotor during vertical and low-speed flight but at higher speeds the rotor is stopped and then functions aerodynamically like a fixed wing. Flight demonstrations of the X-wing are expected next year.

Another new development is the "Advancing Blade Concept"

(ABC). It involves two counter-rotating blades on a single axis, giving the higher speeds achieved by fixed-wing aircraft, coupled with the manoeuvrability of a helicopter.

Sikorsky also believes that its longer term future depends on securing a stake in the next big U.S. domestic helicopter procurement programme, the U.S. Army's plan for development of an advanced light attack helicopter—the LHX. This represents the biggest helicopter procurement in history, with an eventual demand for at least 5,000 aircraft.

The leader

The LHX airframe will be made largely from composite materials, reducing the aircraft's weight and cost and making it less detectable by radar.

Sikorsky claims that it is generally recognised as the leader in applying composite materials to helicopters, and through its existing partnership in the Army's Advanced Composite Airframe Research Programme (ACAP), it will be flying an all-composite airframe in 1984.

The LHX programme will also require advances in

avionics, control technology, and electronic systems integration.

Two other major U.S. helicopter manufacturers, Bell Helicopter Textron (which builds a wide range of light helicopters) and Boeing Vertol (part of the Boeing Group, building the big civil and military Chinook helicopter), have been teamed to produce initially for the U.S. Navy the joint services JVX craft with first flight anticipated in 1987 and the start of production deliveries to the U.S. Marine Corps in 1991.

The JVX is a "tilting rotor" aircraft, making extensive use of advanced composite materials. It is intended to be capable of amphibious assault, combat search and rescue, special operations and electronic warfare on behalf of all the U.S. armed forces. It is also designed to replace in the roles both helicopters and fixed-wing aircraft.

Boeing Vertol is also developing as a private venture the prototype of a twin-turboshaft twin-engine cargo helicopter named the model 980, making extensive use of advanced composite materials.

Guided weapons industry on strong growth track

Missiles

LYNTON McLEAN

THE guided weapons industry is set for unprecedented growth as military planners assess the implications of the rapidly rising cost of new fighter aircraft and look increasingly to missiles and their advanced electronics to meet defence requirements into the 1990s.

Missiles are already emerging as a major force as planners recognise they can no longer afford the high cost of a range of different and increasingly expensive aircraft.

This is happening despite the start of successful multi-national programmes aimed at sharing the costs of developing the new generation of multi-role aircraft. The Anglo-German-Italian Tornado combined interceptor, strike and bomber aircraft is the most recent ex-

ample. The Tornado is in full production in the three countries at a purchase price of about £17m each for the interceptor version.

Yet even before the Tornado has finished its production run, there are doubts about its ability to survive in sufficient numbers over enemy territory to drop its bombs without the aid of airborne missiles.

This has led to the evaluation of stand-off missiles with the Tornado launching them at a distance from the target.

The Tornado is to be fitted as soon as possible with the British Aerospace ALARM anti-radiation missile. ALARM is designed to home in on enemy radar and electronic installations, knock them out and allow the aircraft to carry out its mission.

BAA has a £200m fixed-price contract with the Ministry of Defence and ALARM is currently one of the lead programmes at BAE Dynamics group factories, along with the EAe Sea Eagle anti-ship missile. BAE also won recently a £130m fixed-price contract for the vertical-launch SeaWolf missile system from the MOD. The VL SeaWolf is to be the anti-missile defence system for the Royal Navy's proposed Type 23 frigates.

High costs

Future fighter aircraft are likely to cost at least \$2bn for the initial research and development alone. The R and D costs of the U.S. B-1B strategic bomber are substantially greater. One B-1B bomber costs a record \$62.88m in the fiscal year 1984 procurement programme by the U.S. Air Force.

With such high costs few totally new combat aircraft can be expected over the next decade and beyond. Only the current proposals for a "European fighter," and its comparable U.S. programme for a "tactical fighter derivative aircraft," are likely to emerge as the major firm programmes in the near future, for services in the 1990s.

Instead, Western military planners are putting ever-increasing resources into the development of missiles and weapons systems, designed to be launched from aircraft.

A total of \$2,380m is to be spent in the UK in the current financial year on guided missiles, weapons systems electronics and instruments for the Royal Navy, the Army and the Royal Air Force. This figure is over a third—34.5 per cent—of the gross UK defence production expenditure in 1984-85.

In the U.S. the total missile procurement for the Air Force alone comes to \$3,570.8m. This is over 27 per cent of the total spending by the U.S. Air Force on missiles and aircraft in fiscal year 1984, according to

Congressional statistics.

These developments, in the U.S., the UK and Western Europe, are carried out more and more through multi-national collaboration, which spreads the cost and improves the chances of standardisation of weapons among the Nato members.

Four main initiatives are used for collaborative missile programmes in Nato. The aim is to increase combat effectiveness, strengthen the military and industrial capability of the Nato alliance; reduce unnecessary duplication of programmes and conserve defence resources through greater standardisation and inter-operability of weapons.

Under the first, the "family of weapons" concept, Nato requirements are harmonised for individual mission areas. When complementary systems are found to be compatible the Nato partners interested in particular weapons may start shared development programmes.

The Memorandum of Understanding (MOU) for Advanced

party, known as BBG (Boden-seewerk Gerätetechnik/British Aerospace GmbH) to be prime contractor for the development and manufacture of ASRAAM. It is based at Ubbesbuengen, West Germany. Other Nato countries have expressed interest in joining the programme, including Norway and Canada.

ASRAAM is being developed by the U.S. with Hughes as the lead contractor.

Sidewinder

The U.S. does not propose to develop its own short-range advanced missile beyond the current Sidewinder programme, which involves the purchase by the U.S.A.F. of a further 1,700 Sidewinder AIM-9 missiles at a cost of \$194.8m in fiscal year 1984.

British Aerospace expects to start production of ASRAAM by the late 1980s. The company has already forecast that a production line for the "European" ASRAAM missile will be set up in the U.S. under licence, with missiles entering service in the late 1990s.

The third collaborative approach involves the setting up of dual production capacity for the same weapon system.

Dual production of the same weapon system, such as the F-16 fighter aircraft, and certain missiles, may be through licence arrangements. With the "Imaging" infra-red Maverick guided missile, Italy has been appointed as the leader of a Nato common development of the missile in Europe.

The current members of the consortium are Belgium, Germany, the Netherlands, Turkey and Italy. Discussions between the U.S. and Italy have been held before negotiations leading to a memorandum of understanding.

The fourth initiative involves the "co-developed, co-produced, co-operated" approach, in which U.S. contractors and for U.S. contractors to bid on European contracts.

The formation of the Euro-missile Dynamics Group is a further example of Nato collaboration on missile programmes. The group, which comprises British Aerospace Dynamics, Aerospaiale of France, and Messerschmitt Boelkow Blohm of West Germany is co-ordinating development work on a third generation of anti-tank missiles known as the Trigit programme.

The Trigit missile is expected to involve a medium-range laser-beam-riding missile to replace the Milan anti-tank missile from the early 1990s. The programme is also likely to involve a long-range strike and bombing missile to replace the Swingfire and Hot anti-tank missiles. Substantial production of this missile is expected.

The other major ground-launched missile system now under investigation in the U.S. as well as Europe is the third-generation multiple launch rocket system (MLRS). The first version is well-established with U.S. forces. The second, MLRS II, version is now being developed by Vought of the U.S.

MLRS III is at an early stage of development, with competing consortia from the U.S. and Europe aiming to win full development and production contracts. The two consortia are led by General Dynamics and Hughes respectively.

Team

The General Dynamics team also includes Sperry U.S., the Bracknell Division of BAE Dynamics, Dynasit-Nobel of West Germany, SEP of France and Selen of Britain. The Hughes team includes Aerospaiale of France, MBB of West Germany and the Stierwagen Division of BAE Dynamics.

BAE Dynamics has also joined the Italian Oto Melara gun manufacturer in a teaming agreement, signed in June 1984, to try to win a contract from the Canadian Federal Government for the low-level defence of the Canadian two airfields and field army in Europe. Bids for the work have to be submitted by the end of this month.

BAE Dynamics has offered the Canadian the BAE missile ground to air defence system, radars and communications equipment. The agreement with Oto Melara enables the two companies to offer a comprehensive system including Oto's four-barrel 25 mm Sliam gun. Oto Melara is to make arrangements for Canadian industrial participation and offsets in the work. The agreement follows the agreement signed last April between BAE and Garrett Manufacturing of Toronto, when Garrett became BAE's Canadian industrial partner for the demonstration of offset work in Canada.

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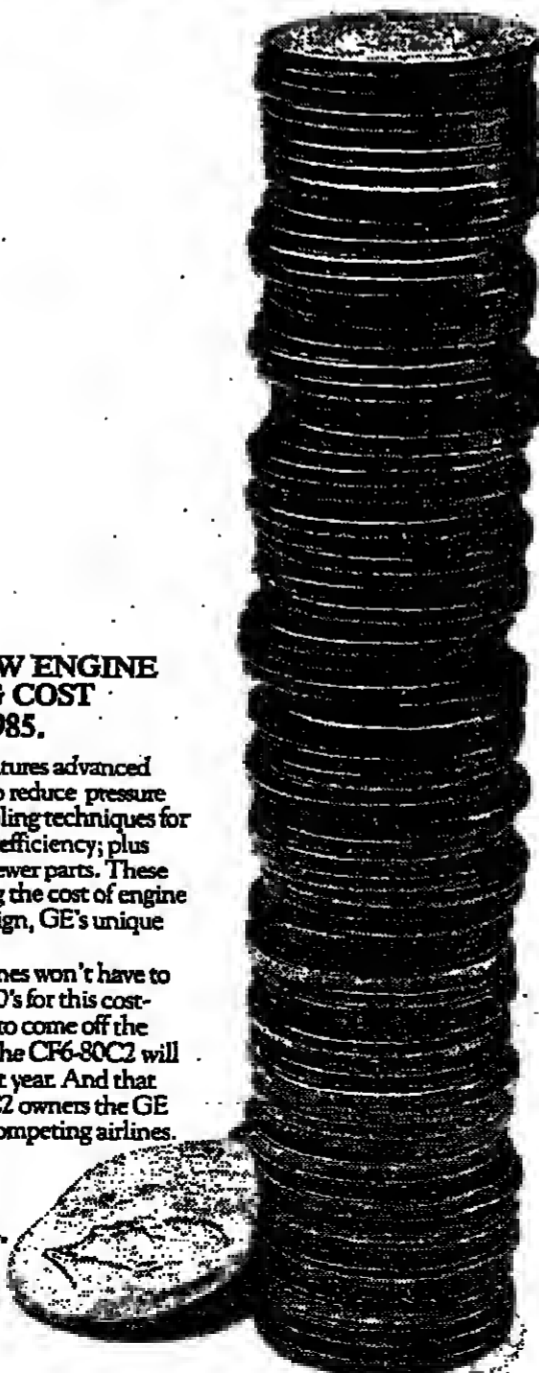
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AEROSPACE 8

Cautious optimism about long-term demand

Engines

MICHAEL DONNE

THE WORLD'S major aero-engine manufacturers, like the airframe builders, have suffered severely through the recession in world airliner markets, but they are hopeful that the signs of improving orders for airliners will be reflected soon in new orders for power units.

Such orders as are available are being fiercely contested, however. The pressures on the aero-engine makers for keen initial prices, accompanied by favourable financing terms, high quality and prompt delivery dates, have become intense.

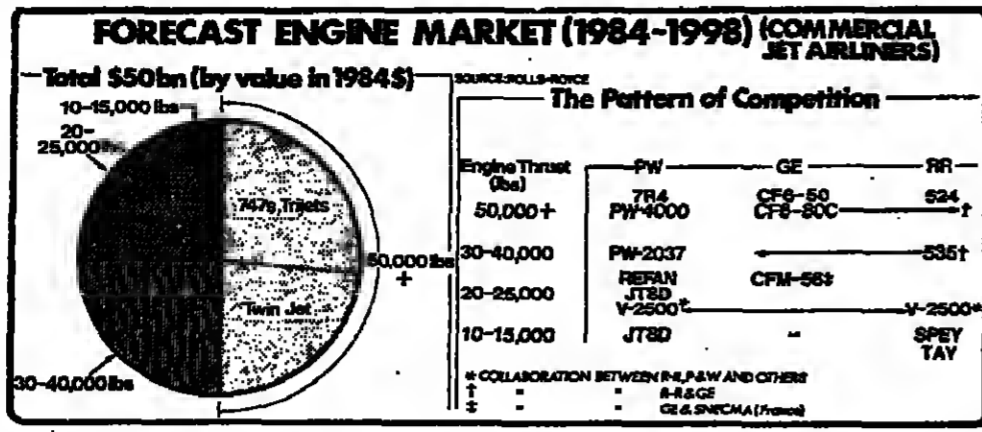
As the engine makers slowly climb out of the trough of the past two or three years they remain optimistic about the long-term high demand for their products.

Rolls-Royce, which has conducted a severe retrenchment programme during the recession, laying off a significant number of workers, now believes that the situation is improving. But, like other major engine manufacturers, it remains cautious about the immediate future.

For the longer-term Rolls-Royce, like other manufacturers, believes the prospects are good, with an eventual world market for commercial turbo-jets worth \$50bn (in 1984 dollars) up to about 1996 in the main categories of engines giving more than 10,000 lb thrust.

The accompanying chart shows how Rolls-Royce sees this market being divided. In addition, in the field below 10,000 lb thrust, there is likely to be a further substantial volume of business in turbo-propeller engines and new small-thrust jet engines.

Rolls-Royce sees the world



commercial jet airliner market amounting to more than 5,000 aircraft over the next 15 years, of which only 900 have been ordered so far. The motivating force behind this inflow of orders will be an average growth in world air traffic of about 5.7 per cent a year in revenue passenger-miles.

The biggest individual market will occur in the short-to-medium range type of aircraft—the McDonnell Douglas MD-80 series, the Boeing 737, and Airbus A-320 types, mainly seating between about 130 and 170 passengers.

Pratt and Whitney, the world's biggest aero-engine manufacturer, spreads its forecasts over a wider area. It argues that from 1985 to 1994, the total world market for aircraft will amount to \$37.3bn, covering commercial, military and general aviation aircraft, with the turbine engine market accounting for \$18.9bn of that sum.

Pratt and Whitney breaks this forecast down by suggesting that the commercial aircraft market will account for some \$17.8bn of sales up to 1994 (not too far from the Boeing Commercial Airplane Company's estimate of \$17.2bn including orders currently in hand but not delivered), with the mili-

tary market accounting for \$20.5bn of sales and general aviation \$7.5bn.

The turbine engine components of these sales are \$7.1bn for commercial turbine engines (rather higher than the Rolls-Royce forecast) for military engines and \$2.3bn for general aviation engines.

Encouraging

Like other engine and airframe builders, Pratt and Whitney sees the potential for sustained traffic growth as encouraging, provided the current economic recovery can be maintained. P and W expects world air traffic growth in 1984 to approach 8.5 per cent, up from 4.7 per cent in 1983, and suggests that growth over the next three years will average more than 7 per cent a year.

It believes that as much as 60 per cent of the forecast sales of aircraft and engines will occur in the second half of the 10 years to 1994, as the economic recovery strengthens, and that annual sales of \$20bn a year could be attained in the early 1990s.

General Electric of the U.S. is the third of the "big three" aero-engine builders, also says that a recovery in commercial aviation business is under way

and that in the first quarter of 1984 alone it received orders for nearly four times as many large commercial jet engines as in the whole of 1983, including engines built by its partner CFM International (in which Snecma of France is also involved on a 50/50 basis).

GE says the fastest selling engine is the new GE-Snecma CFM-56-3 which powers the new twin-engine Boeing 737-300. Engines have been ordered this year for more than 74 aircraft, with the total number of CFM-56-powered 737-300s on order now standing at 124.

As with military and civil aircraft, there are now few entirely new major engines likely to be required up to the year 2000, and most of the engines, for both civil and military, use likely to be needed have already been projected, and are either under development or soon will be.

This does not preclude the continued refinement of existing aero-engine programmes, however, and indeed a substantial part of the development budgets of the world's major manufacturers over the next 15 to 20 years will be spent on improving the noise levels, pollutant emission standards and overall fuel consumption of a wide range of existing

power units, especially those for commercial airliners.

It is also likely that there may be more derivatives of existing engines, in which a sufficient number of refinements to any one engine will justify bringing them together in one big jump forward with a new version.

This is already occurring, for example, with the Rolls-Royce RB-211, with its 535 version for such aircraft as the Boeing 757 twin-engine airliner being steadily improved through the 37,400 lb thrust C model to the 40,100 lb EA, with the likelihood of other new variants to come as the airlines press for improvements, especially in fuel consumption.

Comparable refinements are also likely to emerge from the 535's direct competitor, the recently-certificated Pratt and Whitney PW-2037. Rolls Royce is already offering the 535-Ha as a possible power unit for the projected new tri-jet airliner design under consideration by McDonnell Douglas.

Rolls-Royce has also further improved its most powerful version of the RB-211, the 524D4, producing a further 2 per cent improvement in the cruise performance of the Boeing 747 Jumbo jet. This saves about \$30,000 per aircraft a year in fuel bills.

The British company is also making further improvements to the engine, to become available early in 1987. These will provide 54,000 lb take-off thrust compared with the current 53,000 lb, as well as at least another 1 per cent saving in cruise fuel consumption and lower running costs through improved component durability.

Inevitably, however, the soaring costs of advanced technology in the aero-engine industry, which are limiting the number of entirely new designs, are also forcing the manufacturers into collaborative ventures. The past year has seen some remarkable developments which only a few years ago

would have been dismissed as impossible, even in the mighty U.S. aero-engine industry.

One of these has been the decision by Rolls-Royce and General Electric of the U.S. to collaborate in the future development of engines in two broad fields—on the Rolls-Royce RB-211-535 for medium-to-high thrusts (more than about 40,000 lb) and on the General Electric CF6-80C2 series in the high-thrust range (over 55,000 lb).

The joint application of GE and Rolls-Royce technologies in these two engines will enhance their further development and lead to improved derivatives in each case. Over the longer term the agreement offers the companies the opportunity of jointly developing new and still better engines to satisfy these medium-to-high thrust segments of the market as they may occur.

GE has no competitor to the 535-EA, while Rolls-Royce has not yet developed a new engine, or a derivative of the RB-211-524, in the 60,000-lb thrust range which the CF6-80C2 is designed to achieve.

The respective initial 15 per cent shares of each company in the other's engine programme will gradually build up to 25 per cent, covering finance, development and component manufacture, as well as an exchange of technology. It also envisaged that GE will eventually build the RB-211-535EA and further variants in the U.S., while Rolls-Royce will build the CF6-80C2 in the UK.

Another internationally significant development has been the formation of International Aero-Engines, the consortium comprising seven companies from five nations.

They are Rolls-Royce and Pratt and Whitney, each with equity stakes of 30 per cent; Motoren and Turbinen Union of West Germany, with 12 per cent; Fiat Aviazione of Italy, with 5 per cent; and the three Japanese companies (Ishikawajima-Harima Heavy Industries,



Rolls-Royce's latest civil aero-engine, the private-venture Tay, recently made its first run on the testbed, achieving thrust in excess of 12,500 lb. The Tay is destined to power both the Fokker F-100 twin-engine jet airliner and the U.S. Gulfstream IV executive jet, with orders already placed for over \$400m-worth of engines.

Kawasaki Heavy Industries and Mitsubishi Heavy Industries) is also being offered as a power unit for the Airbus A-320.

Both the JAB-2500 and the CFM-56 Dash 5 will be suitable for the next model in the European Airbus family—the projected TA-11, intended for "long thin" routes. These are long distance routes where the traffic densities do not justify the use of such big aircraft as the Boeing 747 Jumbo jet. The TA-11 would have a payload of about 200 passengers, half that of the Jumbo.

Rolls-Royce is now working on the new Tay 13,500 lb thrust engine, designed initially to power the new generation of 150-seater airliners such as the European Airbus A-320 as well as further developments both the existing Boeing 737 family and the McDonnell Douglas MD-80 Series, or any new airliners these companies may decide to build.

The UK Government is supporting the V-2500 with \$200m in loan guarantees, \$25,000 lb and 25,000 lb, and to have it certificated by 1987 so that it can be available for 150-seater airliners in service by 1988.

Airbus Industrie has already signed an agreement with IAE to offer the engine to prospective buyers of the A-320 Airbus. The IAE V-2500 engine will be competitive with a new version of the existing Franco-

U.S. (Snecma-General Electric) CFM-56 the Dash 5, which is also being offered as a power unit for the Airbus A-320.

Both the JAB-2500 and the CFM-56 Dash 5 will be suitable for the next model in the European Airbus family—the projected TA-11, intended for "long thin" routes. These are long distance routes where the traffic densities do not justify the use of such big aircraft as the Boeing 747 Jumbo jet. The TA-11 would have a payload of about 200 passengers, half that of the Jumbo.

Rolls-Royce is now working on the new Tay 13,500 lb thrust engine, designed initially to power the new generation of 150-seater airliners such as the European Airbus A-320 as well as further developments both the existing Boeing 737 family and the McDonnell Douglas MD-80 Series, or any new airliners these companies may decide to build.

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Collaboration growing

CONTINUED FROM PAGE 1

In the military field demand will also remain consistently high, especially for light tactical combat aircraft. Existing air forces re-equip to keep abreast of advancing weapons technology, and others, especially in the developing world, seek to build up their defence forces.

In many cases, the steady high demand for military aircraft and guided weapons has helped to keep the civilian sides of some aerospace companies alive during the recession, and will continue to do so for some time to come.

Nevertheless, as with civil aviation, the long-term outlook for military aircraft remains good.

British Aerospace's current forecast is that between now and the end of the century some \$600bn in current dollars will be spent on military aircraft worldwide (excluding the Soviet Bloc and China). This will cover more than 24,000 aircraft, of which the biggest single category, combat aircraft, will amount to about 14,000, with trainers accounting for some 6,500, and transports about 3,000, the remainder being accounted for by specialist aircraft, such as maritime reconnaissance, and airborne early warning.

Pratt and Whitney's military forecast is for about 20,000 aircraft, worth some \$320bn in constant 1985 dollars, again with tactical aircraft accounting for the biggest share, some 9,550 aircraft worth about \$184m.

In addition to these figures, the anticipated massive markets for guided missiles of all kinds, and the growing market for spacecraft, are taken into account — each likely to be worth many billions of dollars — it can be seen that world aerospace will continue to be extremely busy.

Probably the most significant aspect of world aerospace since last year's Paris International Air Show two years ago, and indeed in the past year since the Paris International Air Show in 1983, has been the growth of international collaboration, with not only the introduction of new programmes, but the extension of existing ones and the emergence of plans for new ventures.

New ventures

Among the major new ventures have been the launching of the A-320 150-seater Airbus by the European Airbus Industrie consortium, and the formation of International Aero-Engines by Rolls-Royce, Pratt & Whitney of the U.S., Motoren und Turbinen Union of West Germany, Fiat Aviazione of Italy and Japanese Aero-Engines to build the new V-2500 engine for the A-320 and any other potential "150-seaters" that may emerge.

New international collaborative ventures now planned in the commercial aviation field include liaison between Short Brothers of Belfast and Embraer of Brazil to develop a new generation of "commuter" and "regional" airliners for the 1990s and beyond, to replace eventually the existing Embraer Brasilia and the

Shorts 360, and other such aircraft.

In the commercial aircraft field, everybody is widening the Japanese in order to persuade them to share in new airliner ventures. Airbus is especially anxious to have Japanese participation in the prospective T-11 four-engine long-range airliner programme, while Boeing, which already has Japanese support for its 767 airliner programme, is anxious to get more support in any new airliner venture it may undertake, especially in the 150-seater market. Fuji Heavy Industries of Japan has already signed a deal with Fokker of the Netherlands to build tail components for the new Fokker F-50 50-seat turbo-propeller airliner.

In the regional airliner markets, Saab of Sweden is working with Fairchild of the U.S. to build the SF-340 commuter and regional airliner. Aerospatiale of France is working with Aeritalia of Italy to develop the ATR-42; and the Indonesian technology minister, Dr B. J. Habibie, has suggested international collaboration for a new Indonesian-designed 100-seater turbo-propeller airliner.

In the military field, efforts are under way to develop a new European Fighter Aircraft (EFA) programme including the UK, France, West Germany, Italy and Spain, that would involve not only the airframe companies of those countries but also their aero-engine companies on a new power-plant.

France and West Germany are already working on a new anti-tank helicopter, the PAH-2; Italy and Brazil are working on the new AMX fighter; while the UK and U.S., through BAe and McDonnell Douglas, are working on the Advanced AV-8B Harrier and closely studying together the possibilities of supersonic V/TOL.

In the UK other military collaborative ventures are likely on the provision of a new basic trainer for the RAF to replace the ageing Jet Provost, and on replacing the ageing Wessex and Pumas in the RAF. In the former context, the Swiss Pilatus PC-9, the Embraer Tucano and Australian Wamira 2 are all competing with the UK's own Firecracker. In the latter context, Aerospatiale of France and Sikorsky of the U.S. are competing with Westland of the UK.

The list of such international collaborative ventures lengthens steadily. Virtually no major new civil or military aircraft, engine or helicopter venture is likely to be undertaken in future without at least an initial exploration of the possibilities of collaboration. The development costs involved in today's advanced aerospace programmes are so high that very often the only way a company can get into such programmes is to join a multi-company or multi-national venture.

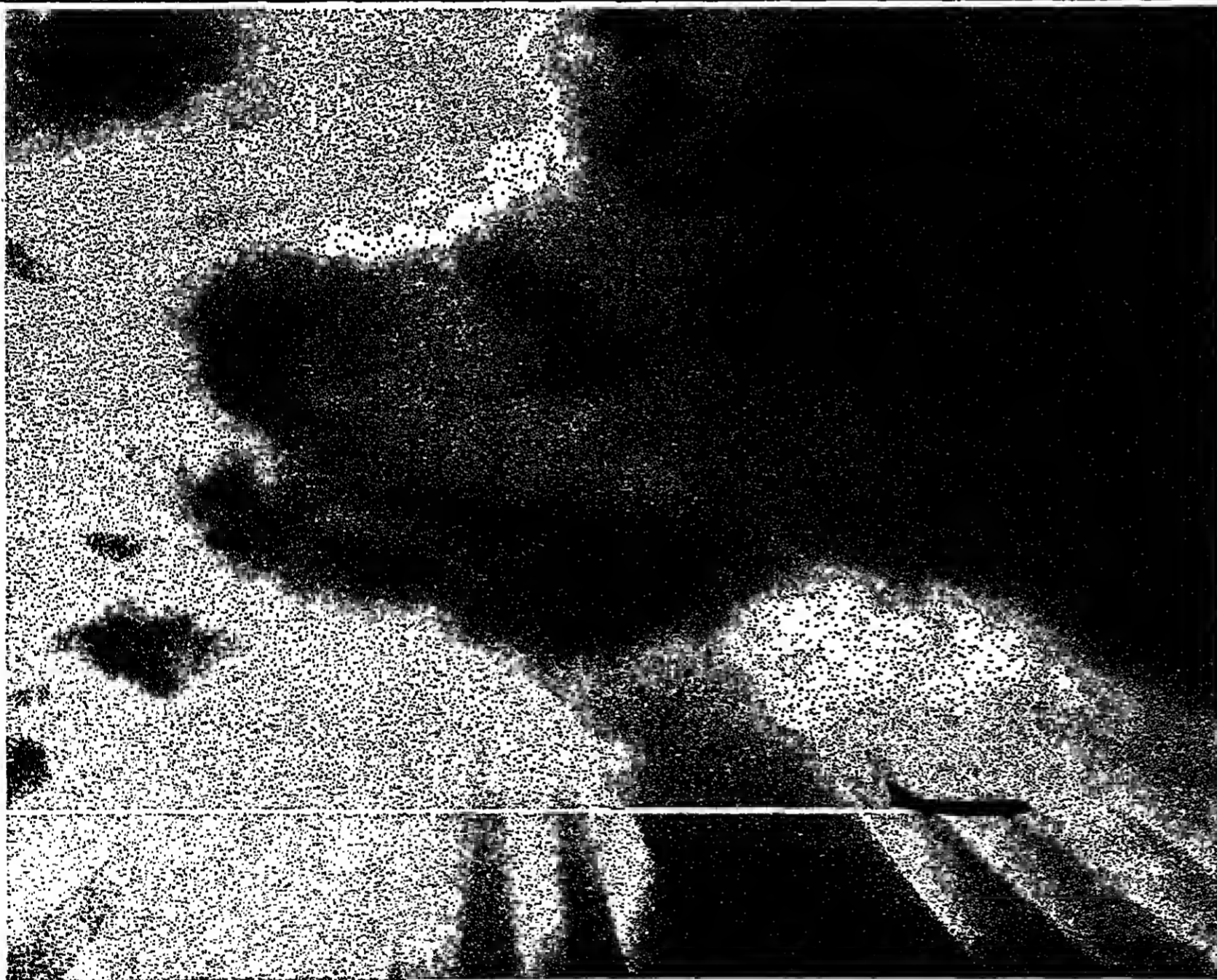
Unwillingness to collaborate is likely to lead to isolation, with those companies being left out in the increasingly bitter fight not only for markets but also for a chance to sustain technological progress. These factors alone are likely to force initially unwilling participants eventually into the relevant collaborative club.

Factors encouraging this growth of international collaboration are not only the wider spread of development cost burden, but also the greater production runs that can be achieved, thereby helping to reduce unit costs. Moreover, some of the former criticisms of collaboration—the higher infrastructure costs stemming from the need for increased international communications and the physical transfer of finished components to common final assembly lines—have evaporated as the techniques of collaboration have been refined.

Satellite communications now provide instantaneous data transfer and voice links, while the availability of large capacity transport aircraft makes the shipment of parts easy. There are still problems—language differences—for example—but there are now so many collaborative ventures, and the difficulties are so well understood, that they no longer pose the seemingly insuperable problems they once might have done.

Nevertheless, stitching up such collaborative arrangements still takes much time and patience, and a great deal of skilful diplomacy. This is evidenced in the difficulties experienced to date in reaching agreement between the five nations trying to put together the new Eurofighter. While there is still talk of individual countries "going alone" in the event of a complete collapse of any collaborative venture, the likelihood is that eventually Europe will draw together, if only to prevent the very large market for such an aircraft falling by default to the powerful U.S. aerospace industry, which has plans for a new tactical combat aircraft of its own for the U.S. Air Force.

One final point needs to be stressed—that even where there is international collaboration, there are usually two or three ventures struggling for shares of the same market. Competition in world aerospace is fierce, and it is intensifying. There are very few markets indeed where any one manufacturer has it all his own way—perhaps the most significant instance is Boeing with the massive 747 Jumbo jet. The rewards for success in any single market—civilian, military, guided weapons or space, can be substantial, but the penalties for failure also can be costly.



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AEROSPACE 9

Ariane success confirms European independence

Space ventures

LYNTON McLAIn

THE LAUNCHING of the tenth and most powerful Ariane rocket from French Guiana on August 4, with two heavyweight satellites placed in orbit, gave a boost to Europe's space industry at a time of debate on its future autonomy and ability to undertake industrial and commercial work in space independently of the U.S.

The success came after the U.S. Space Shuttle Challenger failed to launch two satellites into correct orbits and after the U.S. National Aeronautics and Space Administration (Nasa) aborted the maiden flight of Discovery, the latest Space Shuttle, last month.

The debate is concentrating on two main and related questions. The answers could shape the European, U.S. and embryonic Japanese space industries into the next century.

The first question concerns what role, if any, should the European space industry have in the 85th plans by the U.S. for the first Manned Space Station, to be in orbit by about 1985.

Europe's answer, expressed through commitments by Governments, industry and the European Space Agency to the space station project in turn depends on its answer to the question of how far Europe wants to move towards a space industry completely independent of the U.S.

The form of debate, the 11-nation European Space Agency and the Eurospace group of manufacturers in the space industry, favour much greater European autonomy in space technology.

Eurospace has the more ambitious programme, and says decisions have to be taken by next year if the European industry is to be in a position to exploit the potential of space for scientific, industrial and commercial work that will emerge strongly in the 1990s.

The aim is to provide a co-ordinated approach to Europe's future in space from the point of view of the aerospace industry manufacturers.

major blueprint for the development of a comprehensive European space industry, fully independent of the U.S. by the year 2000. The programme includes a hypersonic space glider and a manned European launcher to be operational by 1997.

Even taking the Eurospace proposals into account, European space expenditure would remain far less than that of the U.S. as a proportion of gross national product.

The Eurospace group urged ESA to lay down as a principle that the proposed programme "should aim at securing European independence in space".

The commercial exploitation of space by European organisations and companies is already set to accelerate, according to Eurospace. The faster pace will be marked by the arrival of direct broadcasting satellites, such as Telecom 1 in France, DFS in West Germany, ITALSAT in Italy and UNISAT in the UK.

The same next-generation launcher should also be capable of lifting men into space by 1997, Eurospace recommends.

Another "long-term necessity" for Europe is the availability of an autonomous manned flight capability. This could be provided by a programme similar to the French HERMES study of a 15-ton hypersonic glider.

Launched by a post-Ariane IV European rocket, HERMES could carry four or five people and payloads in low earth orbit and service manned stations and platforms.

It would be a form of "European Space Shuttle". Eurospace recommends that the final design of HERMES should be decided by 1986, to enable the development to be completed by 1997.

The major differences between the ESA proposals and those of Eurospace concern the launchers and the in-orbit infrastructure. The ESA continues

to base its launching plans on the proposed Ariane V rocket and has no plans for a hypersonic glider or the "HERMES" type proposed by Eurospace for lifting four or five people into low-earth orbit on a European launching rocket.

ESA points out that this glider, or "Spaceplane", would not be launched in the period under study (1985-95) and it also believes that more studies are needed before deciding that such a "Spaceplane" is necessary.

ESA regards EURECA as a "significant first step towards space industrialisation". It would be used for microgravity disciplines including commercial activities, and could be launched in October 1987 as the EURECA-1 mission.

The EURECA-1 "utilisation programme" would follow, with instruments and experiments launched and retrieved and a turnaround time of about two years starting in 1989.

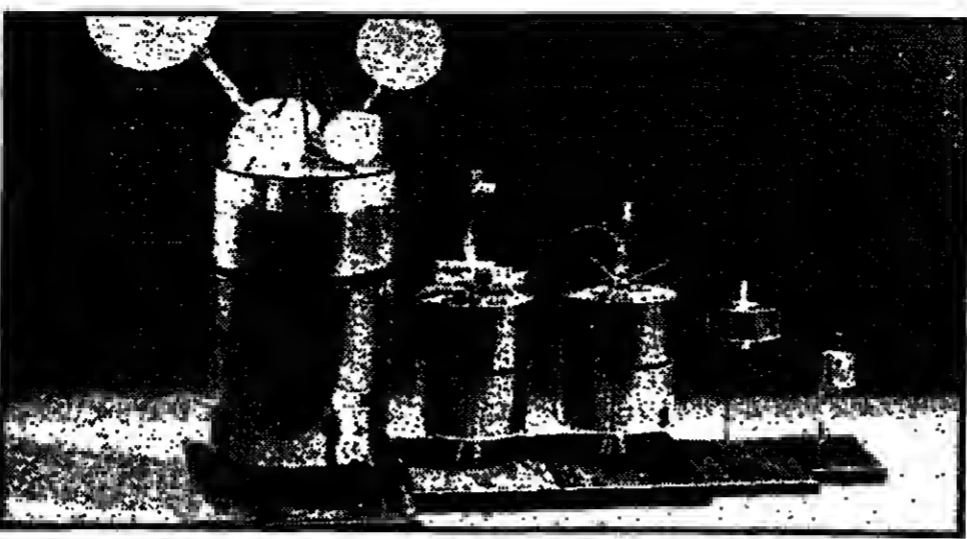
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Eurospace supports the ESA proposal for the EURECA European Retrieable Carrier and urges support programmes to develop robotics for use with EURECA.

Eurospace also recommends European participation in the U.S. Manned Space Station "under U.S. leadership," with Europe making modules for European astronauts to perform autonomous research work.

These modules could be developed later into an independent European space station.

West Germany and Italy have already begun work on Columbus, a project to fit in with European participation in the space station. Eurospace wants to see the Columbus programme adopted as a European venture, with changes to ensure that modules could be developed into a space station. A decision on this needs to be taken this



The remarkable growth in the size of Communications Satellites over the past 20 years is shown in this diagram from Hughes Aircraft of the U.S. (one of the world's biggest manufacturers of satellites), with the tiny Early Bird of 1964 on the right, and the latest giant, the Intelsat VI, on the left.

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year, Eurospace suggests. It would enable a pressurised payload module to be launched and docked to the U.S. manned space station in 1982.

The first men for these missions would have to be launched with the U.S. Space Shuttle. Ariane would be used for carrying cargo. But before the end of the century, if Eurospace's other ambitious plans are realised, Europe would have its own launching systems for carrying crews.

Associated with the growth of satellites is the need for data relays to provide permanent communication between earth and low-orbit stations, platforms and space vehicles, including the transmission of navigational data.

Eurospace wants Europe to have a data relay capacity with a reasonable degree of autonomy by 1990. It also wants the European Space Agency to increase its budget for scientific research in space, but it leaves the question of scientific satellite programmes to interested scientists.

The manufacturers also support the ESA programme of earth observation satellites and recommend the development of an observation spacecraft for disarmament control.

The European proposals would involve the spending of a total of 11,750 MAU (millions of European account units) for the space transport systems alone from 1985 to 2000. This is an average of 700 MAU a year over the period and takes into account post-Ariane IV developments, including the HM60 cryogenic space engine and design work to make the rocket capable of launching men into space.

The total comprises about 6,600 MAU (56 per cent) for development costs and 4,600 MAU (41 per cent) for operations including post-1997 launcher activities and the other operations in the Eurospace programme.

The total does not include spending on science, remote sensing, or communications, however.

The Eurospace proposals call for an average investment of 1,500 MAU a year between 1985 and 2000 in terms of 1984 MAU. This compares with the ESA proposals to spend 946 MAU next year rising to 1,500 MAU in 1991.

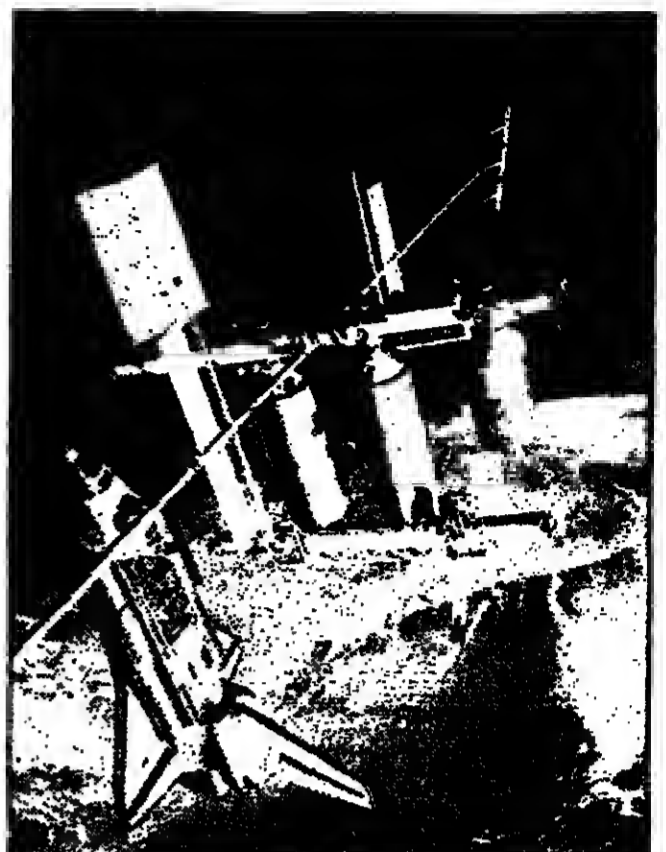
The permanent objectives of a long-term European space policy, according to ESA, should include the need to keep Europe in the forefront of space research, to improve Europe's position in advanced technologies and in the management of complex undertakings.

ESA regards as a "new frontier" an autonomous European capacity in space for automated and manned orbital operations.

Continued co-operation with the U.S. is not ruled out as a means for Europe to reach its objectives more quickly and at less cost. These objectives include telecommunications and earth observation based on an Ariane launch every two years in 1991.

ESA warns that if Europe does not develop these new capabilities "its competitiveness and the independence of its industrial potential might soon be in jeopardy."

"Europe can and must remain in the space race," ESA says. This implies, for the member states of ESA, a "shared vision of Europe's future in space; a consensus on an ambitious long-term goal and plan; a reinforcement of solidarity between member states; and a recognition of the financial effort required."



An artist's impression from Boeing Aerospace of the U.S. depicting the possible structure of the proposed U.S. Manned Earth-Orbiting Space Station, in the early to mid-1990s. Such a Space Station would be serviced from Earth by regular relays of the Space Shuttle Manned Reusable Space Transport System. The Station would serve as a staging point from which Shuttle Vehicles or other spacecraft could move further out into space for a wide variety of missions.

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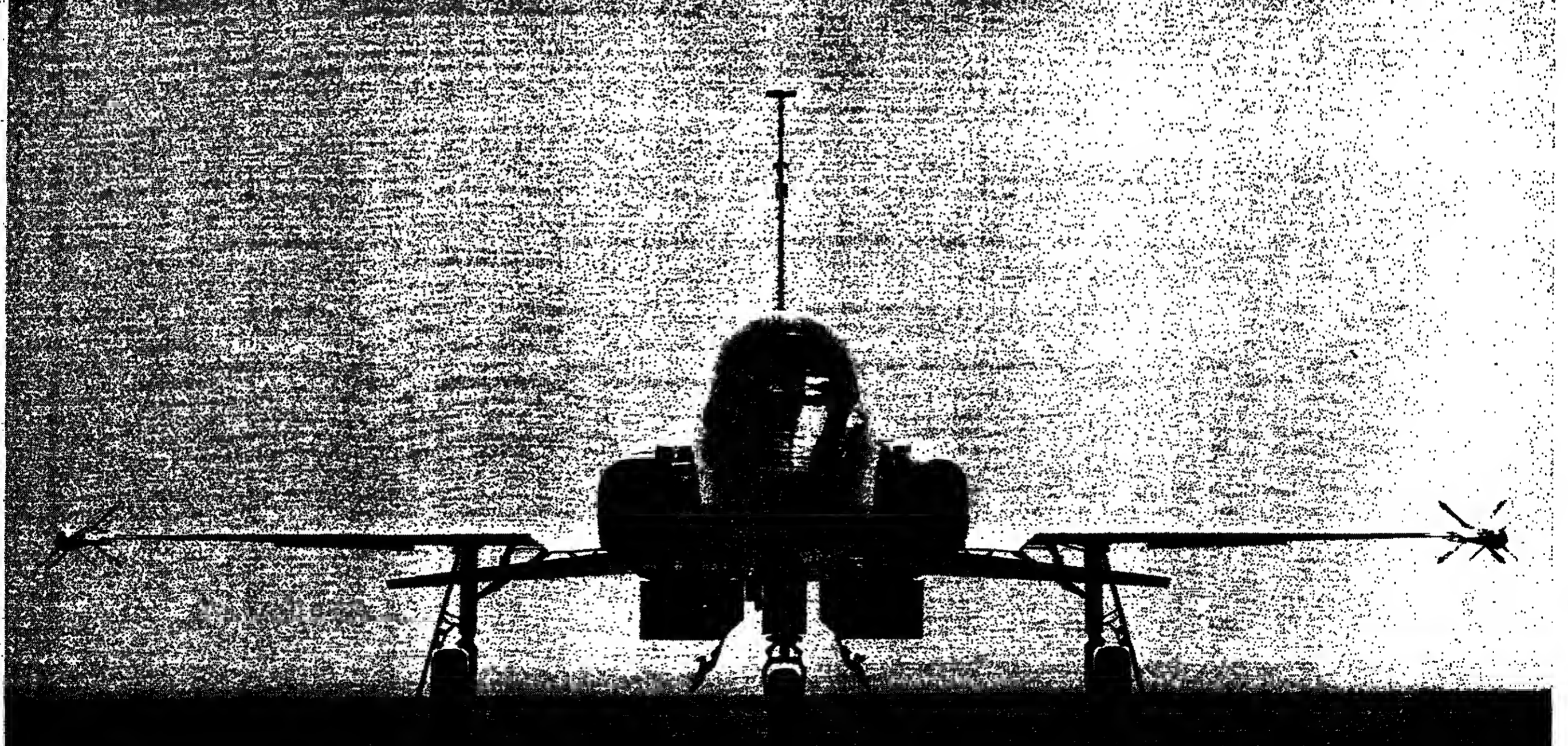
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AEROSPACE 10

Tight rein on costs as prosperity returns



Air travel

Air travel again is growing rapidly, bringing with it problems of financing fleet expansion, and imposing new pressures on airports.

AFTER THE heavy losses incurred by the world airline industry over recent years as a result of the world recession, there are now signs that prosperity may be returning, albeit at present on a modest scale.

Cumulative losses incurred by the world's airlines, as measured by the International Air Transport Association, over the years 1979 to 1983 inclusive are estimated at more than \$8.15bn. Actual operating losses—that is, money lost on flying aeroplanes on passenger and cargo services—amounted to \$1.7bn.

The balance of \$4.45bn represents the amount the industry has had to pay over those years in interest on fleet re-equipment. In some years, such as 1979 and 1983, for example, the airlines achieved operating profits, but were plunged into net losses because of their heavy interest payments.

There are now signs that this pattern may be changing. For 1984, a substantial operating profit of \$1.8bn is forecast, which will leave a net profit of

Airlines

MICHAEL DONNE

about \$250m after interest payments of \$1.55bn, while for 1985, an operating profit of \$1.7bn, and a net profit of \$300m are forecast.

The IATA itself is careful to stress that these forecasts are fragile, and that minor changes in the volume of traffic carried and the amount of capacity offered can turn the small profits back into substantial losses.

For example, the forecast for 1984 is based upon a traffic growth of 5.5 per cent worldwide, and a slightly smaller growth of 5 per cent in capacity (the number of seats or volume of cargo space offered).

But if traffic falls below the forecast by only one-half of one per cent, the financial result would be cut to a profit of only \$70m against the forecast \$250m. If capacity is increased by only one-half of one per cent, then

the profit would be cut to only \$96m.

A combination of traffic falling short and capacity being increased too much would result in the industry falling back into the red, with a forecast loss of \$80m in 1984 and a loss of \$120m in 1985.

The argument, therefore, is for the airline industry to continue to keep a tight rein on its costs, and in particular to try to avoid increasing capacity by offering too many seats just because it appears that better times are on the way.

The director-general of the IATA, Mr Knut Hammarström, has already warned that there are signs on some routes, such as the north Atlantic, of capacity creeping up, ahead of traffic growth, and that now is the time for the airlines to be even more resolute in restraining such capacity growth.

Throughout the period of recession, the industry has been able to survive only by extensive retrenchment programmes, involving cuts in staff, routes and aircraft fleets, and the sale of properties and other assets.

Although there have been some dramatic examples of retrenchment schemes—the best being British Airways and Pan American—in fact, nearly every airline in the world has been forced to some extent to follow suit. This has not prevented some airlines from falling into bankruptcy, although some that fell by the wayside, such as Braniff of the U.S., have been resurrected, though in truncated form.

Leaner and tougher

The effect of these measures has been to ensure that the industry worldwide is coming out of the recession leaner, tougher and more conscious of the problems of survival than hitherto.

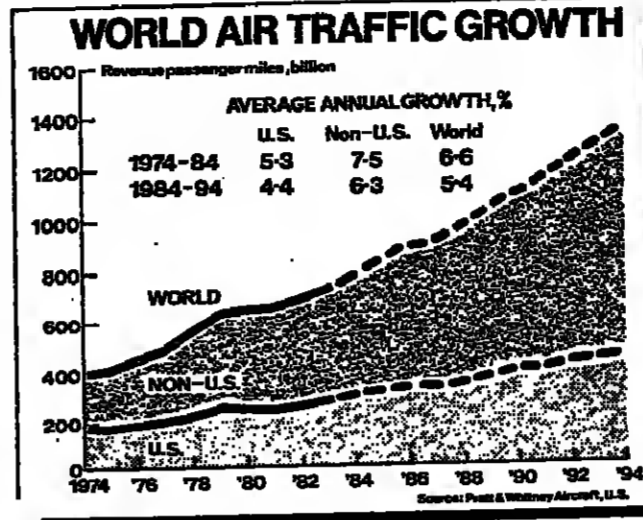
One result that is already being noted is the welcome return to profits by some of these airlines—with British Airways again a particularly shining example—but there are still far too many airlines losing money, and it will be some time before it will be safe to say that the world airline industry is sufficiently out of its difficulties to be able to forecast a more comfortable future.

Whether that future will ever be quite as comfortable again for managements as it was in the 1960s and 1970s, when most of the problems were those of growth, is debatable. Over recent years, some difficulties have arisen which would appear to be permanent, despite the fact that efforts are being made by the IATA and by individual governments to resolve them.

One is the problem of "blocked earnings"—the large sums of cash earned from ticket sales in the developing world which the airlines are not allowed to repatriate by the governments of the countries in which they are earned.

The IATA says that by this past midsummer the total amount of blocked earnings outstanding was \$864m, and that had it not been for the IATA's efforts to recover some \$500m of such cash, the figure would have been over \$1.4bn. Countries in Africa, the Middle East, South and Central America and the Far East and South-East Asia are all involved.

As Mr Hammarström has pointed out: "While sympathy



Aircraft size	U.S. airlines	Non-U.S. airlines	Total Aircraft
0-20	350	750	1,100
20-40	350	500	850
Over 40	400	450	850
Total	1,100	1,700	2,800

One of the fastest growing sectors of world air transport is in the regional "commuter" airline market, carrying passengers over short distances linking small communities with each other or with bigger "hub" communities. The table shows the likely growth in this area through the 1980s and beyond.

As a result, many bids for cheaper air fares, and for greater competition among airlines on international routes, have been and still are being thwarted, with no early signs of any significant breakthroughs of a similar nature to the Anglo-Dutch "open skies" policy

the industry, rather than loosen them. While in Western Europe the UK has taken the initiative, along with the European Economic Commission itself, in seeking greater freedom for the airlines to compete on international routes, the tendency among many other governments has been to tighten their grip on air transport.

They refuse to relinquish any degree of sovereignty over their air transport affairs.

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IATA TOTAL INTERNATIONAL SCHEDULED SERVICES

	1978	1979	1980	1981	1982	1983	1984	1985
Operating result	950	150	-900	-600	-200	1,350	1,800	1,700
Net interest payable	550	500	950	1,300	1,600	1,600	1,550	1,500
Result after interest	400	-350	-1,850	-1,900	-1,800	250	250	200

Source: International Air Transport Association.

Leasing schemes meet high costs

Finance

MICHAEL DONNE

WITH the estimates for future fleet acquisitions by the world air transport industry over the next decade varying upwards from \$172m to replace both ageing fleets and keep abreast of anticipated traffic growth, it is clear that the airlines face a major problem—finding the money.

Although the airlines are now slowly climbing out of the severe difficulties imposed upon them by the recession of the past two to three years, few of them are as yet earning significant profits.

Even where they do so on direct operating account, the net result is still a loss after existing interest payments on fleets often acquired several years ago are met.

The International Air Transport Association has estimated that this year the financial result for the industry will be an operating profit of about \$1.8bn, but after interest of \$1.55bn has been met the overall result will be a net profit of only \$250m.

This interest burden—which covers only the payments by the IATA's member airlines and does not take into account interest payments by the non-IATA airlines worldwide—has been climbing from about \$58m in 1978 to reach \$1.3bn in 1981, \$1.6bn in 1983 and the same in 1983. For 1984 it is estimated at \$1.5bn, and for 1985 about \$1.7bn. This indicates that at current interest rates the world's major lenders—banks, insurance companies and other institutions—already have something in excess of \$1.5bn at stake in the airline and aerospace industry.

This figure is bound to rise as the airlines, their interest in fleet re-equipment rekindled both by the promise of a return to traffic growth and the immense of Government-imposed noise limitation regulations that will render obsolete many of their present aircraft, are obliged to return to jet buying.

The manufacturers' figures for the first half of this year show that it is already happening, with the inflow of new orders considerably higher than in the same period of 1983.

The fact that they, the airlines have little or no cash to spare for new equipment is not dampening their interest. Because of their own long-term confidence in world air transport growth, and their own confidence in all kinds of innovative financing techniques to accommodate their potential customers.

In many instances, especially in the U.S., this is only sound business sense. Much of their money has also already been invested in the manufacture of new types of jet aircraft, so that to help finance their procurement and sales in ensuring the stability of that investment.

More significantly, however, their confidence is based on the conviction, backed by all the forecasts, that aviation is essentially a growth industry that will survive and flourish in the long-term despite the difficulties of the recent past.

Although the new techniques of lending may vary in detail, they are almost all based fundamentally in one way or another on the leasing principle. The lenders themselves acquire title to the aircraft and pay for them. They then lease them to the airlines, for various periods and in various ways, in return for annual payments by the operators.

Few airlines, indeed, now pay hard cash for their aircraft. Saudi of Saudi Arabia has probably been the only major example and even that airline has recently resorted to bartering oil for Boeing 747 jumbo jets in a 10-aircraft, \$1bn deal.

Offset deals

Barter itself—the exchange of commodities of various kinds in return for aircraft—is not unknown in the airline industry but has not been commonly used for commercial aircraft purchases.

announced by those two governments earlier this summer.

The airlines throughout the rest of Western Europe are watching the progress of the Anglo-Dutch experiment, and it is possible that some may seek a similar deal when their own bilateral air agreements with the UK come up for renewal. In principle, however, it seems that a major European-wide breakthrough into the era of cheaper fares is still some way away.

This, in turn, is helping to sustain another of the airline industry's major problems—ticket discounting.

It has been estimated that this method of off-loading tickets on to the market throughout the world is costing the industry as annually in lost revenues on the face value of the tickets thus disposed of. The supporters of discounting (primarily the bucketshop sales outlets, but even some airline executives) argue that if those tickets were not sold at the cut-rates, they would not have been sold at all, and the revenue loss would have been much greater.

Moreover, it is claimed that in some parts of the world, especially the Middle East and South-East Asia, ticket discounting has become almost a way of life in air transport, so deeply embedded that it will be almost impossible to eradicate it.

Some airlines which publicly declare their abhorrence of ticket discounting, resort to it behind the scenes. Nevertheless, the airlines at the official IATA level are trying to establish procedures to minimise, if not eradicate, ticket discounting, with what is claimed to be some degree of success, although, as with blocked earnings, it would appear that discounting will remain a problem for years to come.

There are many other worries facing the industry. They vary throughout the world. The growth of environmental objections to noise at airports causes particular concern, although the airlines themselves argue that noise is the function of aircraft design and manufacture, and that the operators can only ameliorate it by modifying their

own finance companies specifically to undertake this kind of work; and these in turn have established close relations with banks and other institutions capable of finding the cash needed for the sales.

A major jet airliner deal may thus include not only the manufacturers (of both aircraft and engines) but also banks and other lenders, governments and other institutions providing guarantees, such as the UK's own Export Credits Guarantee Department.

Moreover, it is common to find large consortia of banks and other lenders, each with a single bank is prepared to risk its position by lending a particular airline all the money it needs for re-equipment. By spreading the burden among a large number of different financing institutions, however, not only is the risk to each reduced but it becomes easier to put together the immense sums required.

In such arrangements one bank becomes the "lead" organisation, putting together the consortium which provides the cash. Such groups can often include up to a dozen or more institutions all investing in the same deal. Moreover, as these groups have spread over recent years, it is not uncommon to find any one bank with investments spread throughout the world airline industry through membership of several separate consortia.

In this way the banking community has demonstrated its flexibility in meeting what in the past have been particularly heavy demands for new airliners.

The demands that seem likely to be put on the banking community could well become much more severe. If the Manufacturers' forecasts are correct—and there is no reason to doubt them—the \$172m or more that will have to be found over the next decade will require a much larger amount of cash to be put at risk in the air transport industry than ever before.

The big questions are whether the banking and financial community as a whole will be prepared to accept this increase in the commitment to civil aviation and whether it will need to be even more innovative than hitherto in solving the air transport industry's own problems in meeting the

take-off and landing techniques.

The airlines argue that it is for the manufacturers to work much harder, and spend greater sums, on noise attenuation and reduction, with the active support of national and financial governments.

Quieter aircraft

There is little doubt that the new generation of airliners—the Airbus A-310 and the new A-320 the Boeing 737-300 and the McDonnell Douglas MD-80 series—are quieter than those of previous generations, and further reductions in noise, though perhaps modest, are on the way.

Probably the airlines' biggest difficulty over the years ahead will be earning sufficient returns on capital to enable them to pay for the new fleets they will require.

The IATA has estimated that its members, more than 130 of the world's major airlines, will have to find about \$10bn, with only about \$2bn (including the many non-IATA airlines, requiring some \$100m to finance new fleet investment through to the early 1990s.

The number of aircraft involved varies, but it is generally believed that the IATA airlines alone will require some 2,600 airlines of varying sizes (about 1,100 as replacements for existing aircraft, and about 1,500 to meet traffic growth) up to about 1993.

Paying for these aircraft will pose a major problem. It has been estimated that to finance this re-equipment programme, the airlines will need an operating profit representing a return of about 7.5 per cent on revenues, whereas at present, the operating profit represents only about 3.5 per cent of revenues, with a forecast of 4.5 per cent for 1984 and 3.9 per cent for 1985. The industry is thus not yet in a position to pay for its re-equipment.

The industry is already giving rise to a plethora of new methods of airliner financing, with new forms of leasing being devised to ensure that not only can the airlines acquire new environmentally acceptable and efficient equipment, but that the manufacturers also can achieve some returns on their own investments in new designs of engines and airframes.

In all, as Mr Hammarström has said, "While there are still doubts and uncertainties on some major issues, the final message is that there are grounds for looking to the future with increased confidence in an overall improved performance of the airline industry."

While many airlines have certainly undertaken severe retrenchment schemes through the recession, reducing labour forces, cutting out unprofitable routes, selling off unnecessary assets such as hotels, and dropping ageing and uneconomic aircraft, and as a result returning to profitability, it is clear that much more needs to be done.

Costs too high

There are still far too many airlines, now flying unprofitably, who could regain their financial health by more severe labour and asset retrenchment schemes. Costs in many airlines are too high and yields are inadequate. Some indulge in unnecessary expansion, when consolidation should be the keynote.

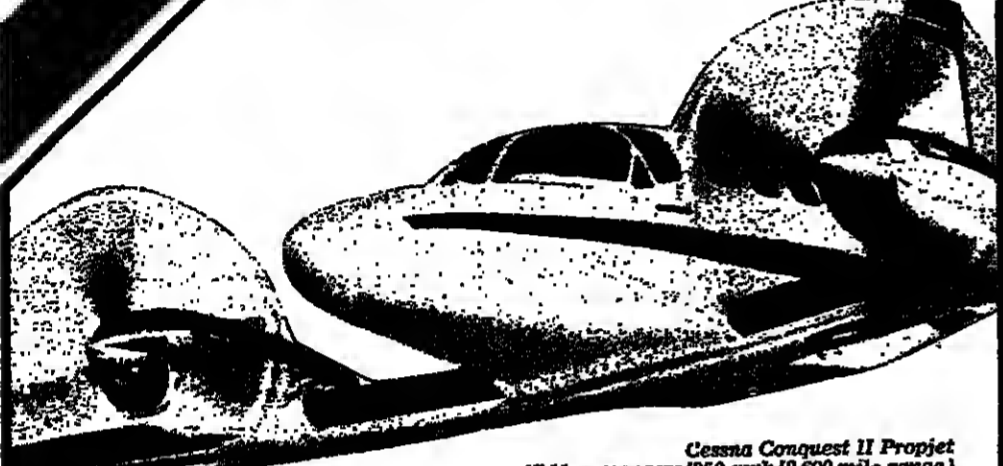
Some buy unsuitable types of aircraft and do not use them correctly. Correcting these deficiencies will remain a major task for airline managements up to 1994.

It seems likely that in the years ahead the major lenders will take an even more active interest in helping financing arrangements than they have in the past. They would be sensible to do so, for the air transport industry's dependence upon them is bound to increase, rather than diminish.

But what matters more than anything else is a return to a stable, long-term expansion of world air traffic. A period of healthy growth in passenger and cargo traffic, if sustained through the remaining 1980s and beyond, will revolutionise the industry and do wonders for its financial health.

As some airlines have already demonstrated—and British Airways is a case in point—the swing back to profitability from a period of near-disastrous losses can be achieved quickly if the correct retrenchment measures, stimulated by an improving economic climate, are firmly taken.

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AEROSPACE 11

Growth forecasts raised

Airports

LYNTON McLEAN

THE RETURN to growth of civil aviation last year and the introduction in Europe of several new cheap fare services in recent months with more to come, have again underlined the strength of demand for air transport and therefore airports.

In the UK alone, passenger movements at all airports are expected to more than double by 1995 compared with 1982, in the high case, and to increase by 90 per cent in the low case.

By the year 2000, passenger movements are forecast to increase by between 80 per cent and 300 per cent of the 1982 volume.

The latest air traffic forecasts for the UK, prepared by the Department of Transport in July, showed that in Continental Europe and many developing countries "recovery is expected to be weaker and hesitant by past standards."

But since the previous forecast report, published by the Trade Department in May 1983, the projections for the growth of UK gross domestic product have been revised upwards, the latest report said.

This reflected the strength of the cyclical recovery now occurring in the UK which has been accompanied by a declining inflation rate and improved productivity. This should provide a basis for sustained growth of output (in the UK) over the forecast period," the report said.

Revised There has also been an upward revision of projected growth among the Organisation for Economic Co-operation and Development countries outside Europe.

Further growth is forecast to continue into the late 1980s and 1990s, although more slowly, so that demand for airport services, and capacity is likely to remain high for some time to come.

At the same time, however, airport authorities around the world do not have many substantial plans for brand new "greenfield" capacity. This is particularly so in the developing world, where modest rates

of growth in gross domestic product and high burden of debt to the developed world have already combined to limit the funds available for capital investment in new projects.

Airports in the developing world and in oil-rich countries have often been prestige projects, where grandiose plans have been excited to provide airport capacity well in excess of the immediate demands.

Even the oil-rich nations have seen their revenues curtailed by sluggish demand for oil, and with existing airport capacity in these countries, especially in the Middle East, more than ample to meet foreseeable demand, "greenfield" airport projects are unlikely in the near future.

Instead, the expenditure still taking place at airports around the world is concentrated on improvements aimed at making the existing terminal buildings and other facilities more attractive to passengers and more efficient for airlines.

New or upgraded terminal buildings are typical of this investment. But in small countries with modest facilities improvements can be limited to updating or replacing passenger and baggage handling equipment, with improvements to air traffic control and especially radar often an essential requirement.

Other ways whereby authorities can increase the effectiveness of their airports without major expenditure on greenfield sites include modest spending on new terminal buildings, or even increasing the length of runways. These enable the authorities to meet increased passenger movements and also to provide for larger, more efficient aircraft such as the Boeing 747, with longer ranges enabling more destinations, farther afield to be served.

At the same time this solution to the problem of handling the growth in traffic provides the airport authority with a potentially cost-effective way of making more efficient use of its own investment in the airport.

Another influence on the development of airports, however, has been the growth of environmental pressure groups. In the UK the recent long-running public inquiry into the British Airports Authority's plan to build the third London airport at the existing under-used airport at Stansted, Essex, in rich farming countryside north east

of London, was a case in point. The inquiry also looked at counter-proposals to build a fifth passenger terminal at Heathrow Airport, even before the fourth terminal at Heathrow is expected to be ready for opening later next year.

No decisions have yet been reached. The Government has not published the inquiry report, and may not do so until late this year or early next. Yet the conflicts between environmental interests and demand for air travel continue unabated.

This is well illustrated by the latest Air Transport Forecast for the UK, published by the Department of Transport. The forecast annual growth rates for airline travel to and from the UK remain strong, but they are below earlier historic levels and are set to decline over the years to 2000.

The DoT gives both "low" forecasts and "high" forecasts. From the base year of 1982, when 58.8m passenger movements were recorded at UK airports, traffic is forecast to rise to somewhere between 80.1m (the "low" forecast) and 100.8m (the "high" forecast) in 1990; to between 93.7m and 133.6m in 1995; and to between 105.5m and 172.5m in 2000. These figures represent an average annual growth of between 3.5 per cent and 6.2 per cent over the 18 years from 1982 to the base year for the forecasts to 2000.

Leisure

International traffic generally is projected to remain the dominant component of UK passenger movements throughout the forecast period. It is forecast to rise from 75 per cent of total traffic at UK airports in 1982 to 79 per cent of total traffic by 1995.

International leisure traffic is predicted to grow slightly faster than international business traffic in the first phase of the forecasts between 1982 and 1990 but more slowly thereafter.

Forecasts of business traffic after 1990 are uncertain because it is "impossible to assess what effect the rapid development of telecommunications may have on certain types of business travel."

A slower growth of leisure traffic at UK airports after 1990 is forecast. This reflects mainly the reduced growth projected for leisure flights from the UK, which in turn mirrors the declining potential for further

penetration of the UK leisure market, the report says.

Foreign leisure travellers, however, are projected to increase quickly after 1990, because real incomes abroad are likely to maintain strong growth and also because the UK is assumed to become cheaper than other holiday areas as sterling's effective exchange rate declines.

The net result in this forecast is to make foreign leisure flights the fastest-growing sector at UK airports," the report says.

These patterns of continued growth, whatever the final outcome, have already led to a conflict between environmental interests and airport operators and airlines in the form of the Government-imposed limit on aircraft movements at Heathrow, London, the world's busiest international airport.

The Government imposed a limit of 275,000 movements at Heathrow Airport in its decision to allow Terminal 4 to go ahead. This was "in order to minimise the noise nuisance," the Department of Transport said.

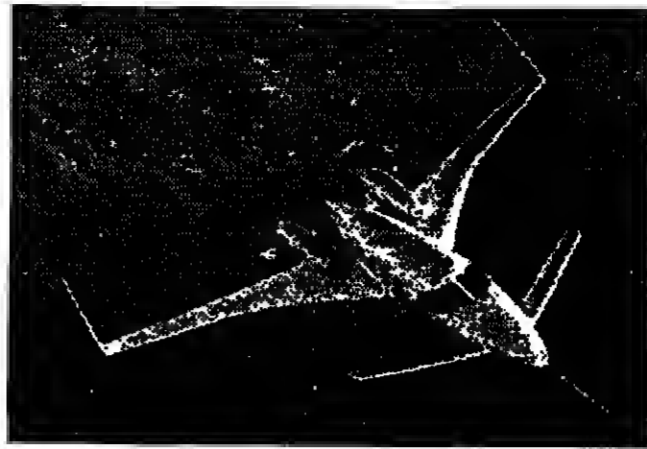
The limit is set to come into force when Terminal 4 opens late next year. The limit is likely to be exceeded before then, however, with a level of 276,000 ATM's at Heathrow between November last year and October this year.

Demand for landing and take-off "slots" is expected to continue to increase until the early 1990s, when, on present assumptions about patterns of traffic and aircraft size, it could exceed the limit by 25,000 movements a year.

The Department has considered three main approaches to the problem of curbing this demand at Heathrow. These are: price mechanisms; the exclusion or restriction of certain categories of traffic or services; and the division of the limit into quotas for international and domestic services.

At the same time the Department wants the "preservation of overall environmental standards." All the elements of an all-to-familiar conflict between continued public demand for air transport and the need to protect the environment from an unrestricted increase in aircraft movements are present in the Heathrow debate.

The final arbiter has to be the Government, already enmeshed in a debate over the future ownership of British Airports Authority airports, including Heathrow, and the progress of civil aviation in the UK.



One of the more dramatic new designs for business and executive aircraft is the U.S. Beechcraft Starship One, now under development. An 85 per cent scale model is already flying in the U.S. to prove the validity of the design.

GENERAL AVIATION 1985-1994

Aircraft type	Aircraft Market (constant 1985 \$)		World	
	Units	\$ bn	Units	\$ bn
Feeder-commuter				
fixed wing	1,100	5.5	1,700	8.5
Business-utility				
fixed wing	10,000	33.0	4,700	12.5
Helicopters	5,000	7.9	6,000	8.5
Total market	16,100	45.0	12,400	29.5

Aircraft type	TURBINE ENGINE MARKET		World	
	Units	\$ bn	Units	\$ bn
Feeder-commuter				
fixed wing	2,500	1.5	4,700	2.7
Business-utility				
fixed wing	19,000	10.4	8,600	4.0
Helicopters	8,500	2.1	10,900	2.5
Total market	30,000	14.0	24,200	9.2

Source: Pratt & Whitney Aircraft, U.S.

Volume of deliveries cut

Business Aviation

LYNTON McLEAN

THE RECESSION world-wide over the past few years has taken a particularly heavy toll of the business and general aviation market—small, light aircraft with seating capacities from two up to about eight to 10 passengers.

This has been reflected in considerably lower order books, which, in turn, has substantially cut the volume of deliveries by the major manufacturers so far this year.

As with other sectors of aerospace, however, the signs are of a revival, although it may be slower to develop than in some other parts of the industry.

In the U.S., traditionally the main market for general aviation and business aircraft, the first half of this year showed that demand is beginning to pick up. The order book billings for the U.S. manufacturers rose by 15.3 per cent to \$740.9m in the six months to the end of June, compared with the corresponding period last year, according to the General Aviation Manufacturers Association (GAMA), of the U.S.

Over the same time, however, total deliveries by the makers fell a fifth to 1,087 aircraft compared with the first half of 1983 reflecting the earlier lack of

new orders. Export deliveries were the worst affected, down almost 50 per cent to 158 aircraft compared with the period last year, in the face of a strong export order books stood at \$112.1m at the end of June, a fall of almost 40 per cent on the period last year.

Deliveries of business jets, however, rose by 23.3 per cent to 74 in the first half this year compared with the half year period in 1983. This was in contrast with the decline of over a quarter in the number of turboprops delivered, down to 105 aircraft, and the decline of 17.5 per cent to 184 delivered in the piston engine category in the six months to the end of June compared with the same months of 1983.

Despite the mixed fortunes so far this year, the industry is confident that the business aviation sector in particular remains a growth area, especially where "on demand" air transport is required.

"Dispersion of commercial and industrial plants and facilities; decentralisation of the management function and convenience to resource raw materials add to the rationale of need. Pent-up demand for business aircraft will soon burst into active demand," forecasts the National Business Aircraft Association (NBAA), of the U.S.

Mr John H. Winant, president of NBAA, forecast earlier this year that "a healthy booking of orders for new aircraft" would begin in the latter part of this year, and this prediction now appears to be coming true.

Purchase of business aircraft is dependent on a "handful of key indicators," says Mr Winant, but the most important is total after-tax profit. This is the money available for "discretionary capital goods purchases," such as business aircraft.

"When after-tax profit levels are high, the conditions for purchase of a business aircraft are fertile," he says.

The U.S. has a forecast demand for up to 10,000 business aircraft over the decade to 1994. This level is over twice the number of such aircraft expected to be sold in the rest of the free-world put together, according to Pratt and Whitney, the U.S. manufacturer of aircraft engines, in a survey of likely demand for engines to the mid-1990s.

Helicopters

The Pratt and Whitney survey showed that up to 14,700 new business-utility fixed-wing aircraft could be required in the U.S. and the rest of the non-Soviet world between 1985 and 1994, with a total value of \$45.5bn at constant (forecast) 1985 dollar prices.

Up to 10,000 of these business-utility aircraft, valued at \$33bn, are expected to be sold in the U.S., with the remaining 4,700 aircraft valued at \$12.5bn sold elsewhere.

In addition, the U.S. market is expected to absorb 5,000 helicopters between 1985 and

1994 for general aviation use, with a total value of \$7bn. A further 6,000 helicopters, valued at \$3.5bn, are forecast to be sold in non-U.S. markets.

Despite these optimistic longer-term forecasts, the short-term situation seems likely to show a modest growth in production in the U.S. industry, reflected in a slow upturn in deliveries. The expansion of the business aviation sector will be closely linked to the growth of the U.S. economy, and a sustained growth in the latter will have "a significant, positive impact on the demand for general aviation," in Mr Winant's view. For the longer term, the net addition to the U.S. business aviation fleet is expected to average about 7,300 new aircraft of all sizes and types each year between 1984 and 1995.

The highest growth rate is forecast to be in the "turbine rotorcraft" fleet (the helicopters), where there would be "significant growth," of 7 per cent per annum.

Smaller growth rates are expected in the turbine-powered aircraft sector, with a forecast annual growth of 5.8 per cent. This growth rate, if achieved, would increase the size of the turbine-powered fleet from 9,000 aircraft last year to 18,000 expected in 1995.

The sector with the lowest growth rate is forecast to be for active single and multi-engine piston aircraft, where the size of the fleet is expected to increase by 2.4 per cent per annum to 1995.

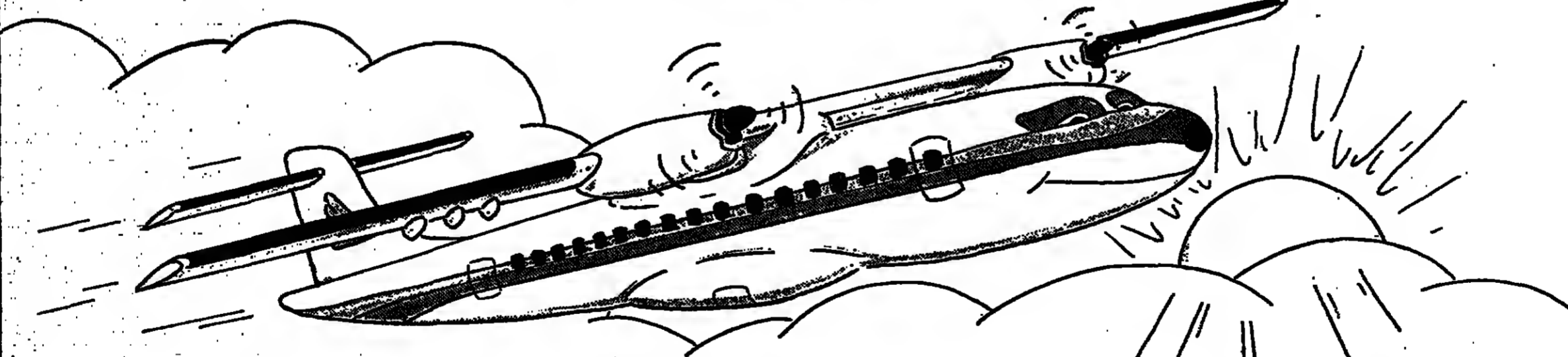


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AEROSPACE 12

Leading companies adapt to fall in civil orders

United States

TERRY DODSWORTH

THE U.S. aerospace industry is one of the country's three premier export sectors...

Until two years ago it also enjoyed a long record of solid growth with shipments rising from \$21bn in 1979 to \$64.8bn in 1981...

The recession, however, did not hit the aerospace sector as hard as many other of the country's basic industries...

Both Boeing and McDonnell Douglas have taken long strides in the past 12 months to establish the principle that newly-hired workers do not take jobs at the same rate as established employees...

The unions have fought hard against conceding this point, but they have mainly lost as the companies managed to introduce much more progressive, pyramid-type wage systems...

Just as importantly for the companies, these systems will also cut costs substantially over the longer term, since new employees will join the workforce at much lower wage rates than in the past.

A second phase of the cost reductions was in cutting non-

essential expenditure, either by trimming normal capital spending or soft-peddling research and development...

At Lockheed, for example, a key decision in 1981 was to stop work on the L-1011 TriStar project (taking a heavy write-off into the bargain) and concentrate on military work...

McDonnell Douglas decided late last year to abandon research and development work on commercial aircraft because of its bleak order prospects...

Talks with airlines

McDonnell Douglas stopped short of saying that it would abandon airliners altogether. But it left a distinct impression that it might drop out some time in the future...

At the same time, however, it threw its resources into the MD-80 jetliner project, which is designed to update the old DC-8. It has since been rewarded with significant sales...

Linked to these decisions to limit the range of commercial models, there has been an increasing emphasis on military projects. This may to some extent have been forced upon companies by the slump in commercial airlines...

As Mr Alan Benasuli, an analyst at brokers Drexel Burnham Lambert, puts it, President Reagan's big boost in the military budget is only toppling out a cycle of defence spending which began under President Carter...

Even so, the burgeoning defence budget has been a big factor in helping the major companies score the big increases in net earnings recorded last year.



The aerospace giants are being joined by rapidly developing newcomers around the world.

McDonnell Douglas has added another element to this tactic of moving away from commercial airliners by diversifying into other industrial sectors...

The group already has its own large data-processing business, to which these two newcomers will be attached.

Meanwhile, McDonnell's decision to reduce its current airliner development programme underlines the economic fragility of commercial aviation...

Some of the larger carriers have also begun to upgrade their fleets—the American Airlines order at McDonnell Douglas, for instance—but there has not yet been an enormous rush to buy and the U.S. international airlines remain extremely reluctant customers.

are still in deep financial trouble, as its \$50m second-quarter loss shows. One problem they have faced in the home market is that many of the new airlines which have appeared to challenge the established carriers use second-hand aircraft...

Sales drop

The sluggishness of the civil airliner market is illustrated by Boeing's first-half figures this year. The world's largest commercial aerospace company saw net profits for the period slip 1.1 per cent to \$180m...

The fall was all on the civil aircraft side. Military sales were up, with those to the U.S. Government totalling \$1.95bn, an increase of \$426m on a year earlier...

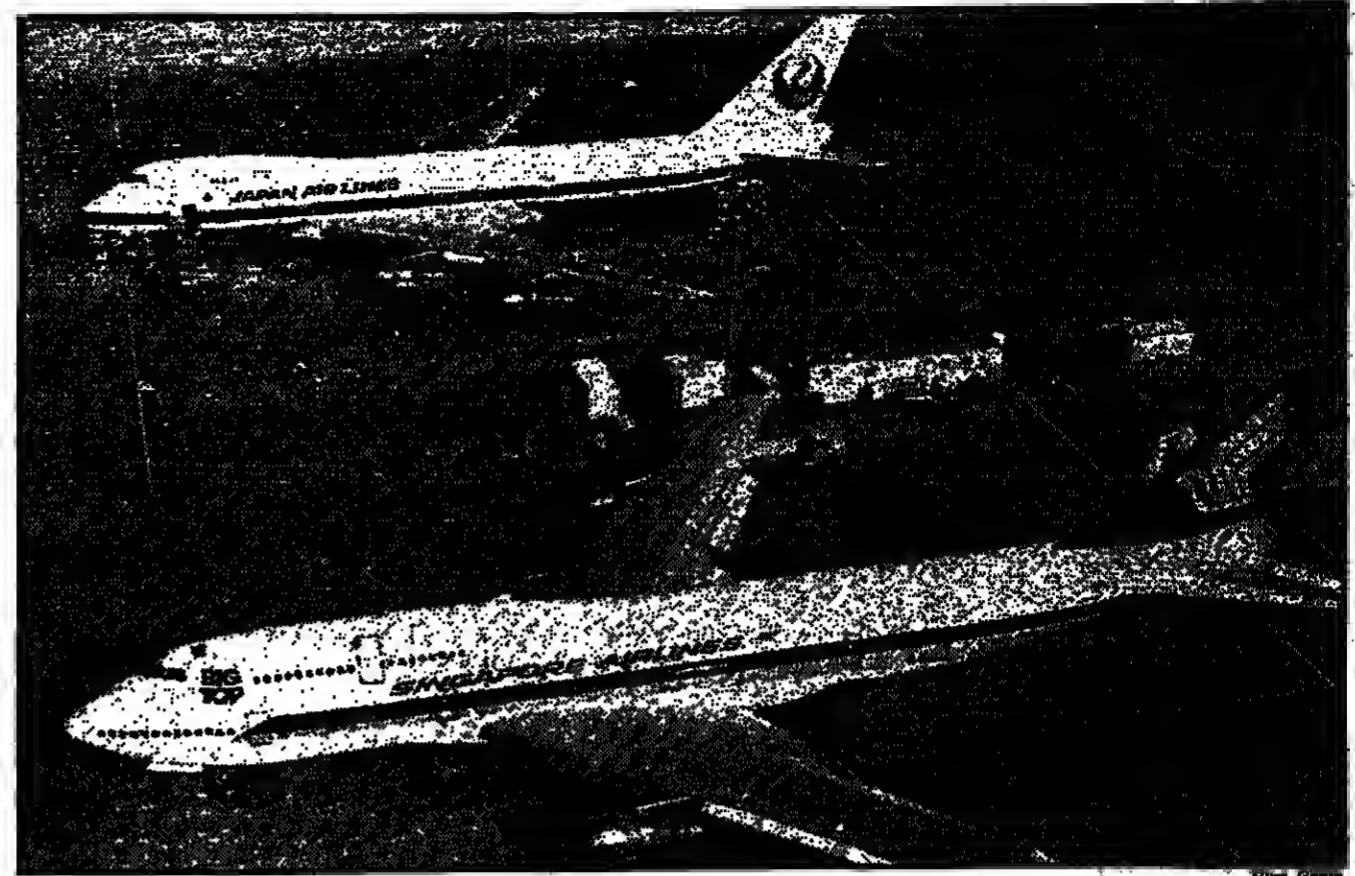
The problems in civil aviation are underlined by the contrast with Lockheed, which hit a difficult financial period a few years ago, and decided to concentrate almost exclusively on military and space work.

Two months ago Lockheed paid its first quarterly dividend since 1969, while in the first half of this year it lifted earnings by 22 per cent to \$146m—only \$9m less than the much larger Boeing.

Most of the other defence-based companies are also enjoying the benefit of the increase in Government spending, although the field is competitive and not without its problems.

Grumman, for example, has shown only slow growth over the past 18 months. In the second quarter of this year it actually experienced a decline in earnings, which fell 4 per cent to \$25m.

Grumman has received a bread-and-butter Navy contract to improve the existing A-6 and F-4 aircraft for about \$1bn. Northrop, however, which is also gambling heavily on its



Jumbos to be stretched further

The Boeing 747 jumbo jet, the world's biggest commercial passenger airliner, continues in production at the company's Everett factory, near Seattle. The latest version is the Series 300 (seen in the foreground) in the colours of Singapore Airlines, which calls it the "Big Top"...

fuselage enabling the airliner to seat between 450 and 500 passengers according to interior layout. Boeing's own long-term plans include the possibility of stretching the upper deck still further and perhaps also fitting new wings and engines of greater power to allow an even bigger passenger load...

U.S. AVIATION ACTIVITY FORECASTS

Table with columns for Historical (1979, 1982, 1983), Forecast (1984, 1985), and Percent average annual growth (79-82, 83-84, 84-85, 85-89). Rows include Air carrier, domestic; Rev. passenger emplacements (m); Rev. passenger miles (bn); Commuter carriers; Rev. passenger emplacements (m); Rev. passenger miles (bn); Fleet size; Air carrier; Commuter; General aviation ('900); Hours flown (m); Air carrier; General aviation.

U.S. COMPANIES' EARNINGS

Table with columns for Company, Sales 12 mths '83, % chng. 1983 net earnings, Year, 1984, % chng. 1984 net earnings, 1984, % chng. 1984 net earnings, 1984 net earnings, % chng. 1984 net earnings. Rows include United Technologies, Boeing, McDonnell Douglas, General Dynamics, Lockheed, Martin Marietta, Northrop, Grumman.

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Sikorsky's SUPERSTALLION H-53E is the Western World's largest heavy-lift helicopter, now being used by the U.S. Marines and Navy. The MH-53E will be used by the Navy as the next-generation airborne minesweeper.

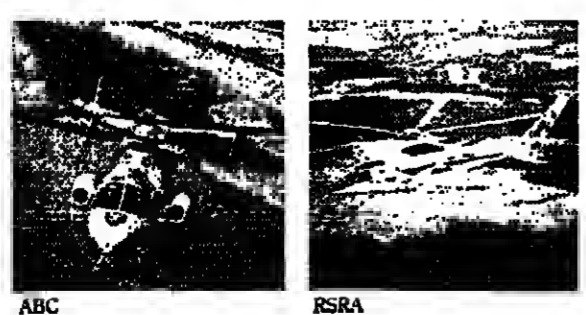
The Sikorsky S-76 MARK II is the finest commercial helicopter in its class for both oil and corporate transportation.

The H-76 military helicopter is a new multi-role aircraft destined for worldwide service.



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Backed by the strengths of its parent, United Technologies Corporation, Sikorsky is leading the rotary-wing industry into the future. Sikorsky's Advancing Blade Concept (ABC) is the fastest in the world. And its Rotor System Research Aircraft (RSRA) is already testing 21st Century technology.



Sikorsky. The Leader

Strong federal funding

Canada

MICHAEL DONNE

FOLLOWING the major financial restructuring by the Government earlier this year of the two major Canadian aircraft manufacturers, Canadair and the de Havilland Aircraft Company of Canada, it is now hoped that they will be able to climb out of the difficulties they faced in the early 1980s.

As a result of Federal Government funding totalling some C\$1bn, plus similar amounts of cumulative debt written off, the two companies have been given almost a new lease of life.

The Federal Government believes that both, slumped down to meet the current realities of the world marketplace, will be stabilised this year and return to profitability in 1985 or soon thereafter, especially if the recession is genuinely fading, leading to a revival of world airliner demand.

As a result of this traumatic exercise, the longer-term forecasts for the Canadian aerospace industry have been revised. The industry's turnover of about C\$3bn last year is expected to rise to around C\$7bn by about 1987, while employment, which fell from 41,000 in 1982 to about 38,000 last year, is set to rise again, reaching about 50,000 in 1987.

Much of the Canadian industry's recovery, of course, will depend upon the scope of the recovery over the recession overseas, where the bulk of long-term demand for the Canadian aircraft manufacturers' specialised types of small airliners and executive transports will lie.

In particular, the commuter

and regional airline market is of significant interest, especially to de Havilland Aircraft; but competition is fierce in the market for small airliners, with the Brazilian Embraer Brasilia, the Swedish U.S. Sab-Fairchild 940, the Franco-Italian ATR-42 and the UK Shorts 330 and 360, all fighting for available orders.

More than 100 concerns

Overall, the Canadian industry includes not only the two major aircraft builders but also Pratt and Whitney Aircraft of Canada, an aero-engine builder which is a major subsidiary of the U.S.-based United Technologies Corporation, and well over 100 other companies active across a wide spectrum of aerospace affairs, including, for example, Spar Aerospace and many companies making components of all kinds from avionics to hydraulics, communications systems, simulators, fuel systems, and so on.

Of the major manufacturers, de Havilland, or DHC as it is known, of Downsview, Ontario, has specialised in recent years in short-take-off-and-landing aircraft (STOL) and has had considerable success with such small aircraft as the 19-seat Twin Otter, of which close on 1,000 have now been sold.

Current emphasis is on the Dash 7 four-engined turbo-prop 50-seat quiet STOL (airliner, which is already in wide service, especially with the smaller commuter-type and regional airlines.

Demand for this highly efficient airliner continues, and it is establishing a significant reputation as a "good neighbour" aircraft in small communities where local airports tend to be closer to city centres than elsewhere.

In the UK the Dash 7 in the fleet of Brymon Airways is in-

tended to be a major user of said that the task now facing the projected Stolport now under consideration for London's Docklands, close to the City, and the planned hub of a network of commuter air services, both domestic and international.

Following the success of the Dash 7, DHC has developed the smaller companion Dash 8, a twin-engined 36- to 39-seater quiet short-range transport, which is now in quantity production. To date, five development and certification aircraft are engaged in the extensive flight test programme, with over 1,200 hours of flying achieved.

Deliveries to customers are expected to start later this year. The Dash 8 will be demonstrated at the forthcoming Farnborough International Air Show, where its STOL performance seems likely to arouse considerable interest.

Earlier this year, the other major aircraft builder, Canadair, following substantial losses in 1982 and 1983, also underwent a major financial restructuring with the aid of the Canadian Government. As a result, the "New Canadair" set up under the restructuring plan is believed of the Old Canadair's debt burden, and now has a positive net worth.

Canadair reborn

According to the company's last annual report, it is expected that the New Canadair, relieved of the interest costs which formerly burdened operations, will be profitable by 1985, if not before, and any short-term cash requirements for existing programmes and activities will be met through conventional banking arrangements without the need for further Government guarantees.

Mr Gilbert S. Bennett, president and chief executive, has

the task now facing the company is to re-establish its market image and self-confidence, and re-establish its reputation for quality products and superior customer service and support.

Canadair's major aircraft programmes currently include production of the twin-engined Challenger Jet executive transport, and the CL-215 twin-engined amphibian, intended primarily for fire-fighting (a "water-bomber") but adaptable to a wide range of other duties.

The company is also engaged on a wide range of sub-contracts for U.S. and Canadian military aircraft and parts for the Boeing 747 and 767 airliners. The military aircraft involved in this programme include the Lockheed P-3C Orion, the McDonnell Douglas F/A-18 Hornet and the Lockheed C-5B transport.

Besides its work on manned aircraft, Canadair is also developing or producing various unmanned remotely piloted vehicles for military roles such as surveillance and target acquisition. One is the CL-289, based on the existing CL-66 system, still in production.

This is an international programme, in which Canadair is linked with Dornier of West Germany, to develop a remotely controlled recoverable airborne system for accurate battlefield surveillance. Extensive trials have been conducted, and the company said recently that it expected a pre-production order ahead on the programme by the end of this year.

Canadair is also working on the C-227, a surveillance/target-acquisition system with VTOL (vertical take-off and landing) capability. The company said recently that it was seeking funds for full-scale engineering work, but meanwhile development would continue at

CONTINUED ON PAGE 13

AEROSPACE 13

Still keen to learn from West

Soviet Union

MICHAEL DONNE

THE AEROSPACE industry of the Soviet Union rivals that of the U.S. in size and variety of capabilities. Precise statistics for the output of the Soviet aerospace factories, or details of the numbers of factories and people employed, are not publicly revealed; but that it is a very large industry is shown by the fact that it meets not only the Soviet Union's own total needs for civil and military aircraft and missiles of all kinds and spacecraft, but also supplies much of the civil and military needs of the Warsaw Pact nations.

sive Soviet developments are occasionally displayed, appear to be aimed more at impressing the West with the results of Soviet technology than with winning orders for the products involved. At the same time, however, despite the undoubtedly rapid strides made by Soviet aerospace technology over recent years, the missions at the airshows are also intended to learn as much as possible about the progress of Western technology.

Russian reticence

Western observers at recent Paris and Farnborough shows have noted the determination with which Soviet missions have collected information — freely available — on the Western aerospace industries' own progress while being reticent about the Soviet Union's own achievements.

This technological inquisition appears to have paid dividends. A recent comparison of Soviet and Nato forces prepared by Nato itself indicated that the Soviet Union was now making significant progress in areas such as missile technology and in spacecraft, where the West in general had previously been in the lead.

Other than the Warsaw Pact, however, and a few other countries, such as Cuba, some countries in the Middle East and in South East Asia, Soviet aerospace exports are limited and generally confined to military aircraft and equipment.

Western observers at recent Paris and Farnborough shows have noted the determination with which Soviet missions have collected information — freely available — on the Western aerospace industries' own progress while being reticent about the Soviet Union's own achievements.

but the comparisons do indicate the existence of an immensely powerful Soviet aerospace industry capable of a wide spectrum of activities. The structure of the Soviet aerospace industry is based on a series of "Design Bureaux," headed originally, and in some cases still headed, by some of the most famous names in aviation. These include Antonov Bureau, primarily involved in the design, development and manufacture of a wide variety of transport aircraft, for civil and military purposes, with a very large four-jet aircraft, the An-400 now under development.

Some idea of the size and complexity of the Soviet aerospace industry, and of its technological capacity, was given earlier this year in the same Nato force comparison mentioned above. This showed that in 1983 the Warsaw Pact countries, primarily supplied by the Soviet aerospace industry, had up to 400 supersonic bombers of the Backfire, Badger and Blinder types, against all for Nato.

The Warsaw Pact also had some 2,250 fighter-bomber aircraft in Europe alone, against 1,960 for Nato; close to 4,200 intercepter aircraft against Nato's 795; and some 585 reconnaissance aircraft against Nato's 225. The Warsaw Pact's total air force in Europe amounted to 7,430 aircraft against Nato's 2,990.

The figures must be viewed with caution, for the Nato nations, especially the U.S., also keep thousands of combat aircraft in their own territories;

the latest development being the MIG-31 Foxhound A (its Nato code-name) supersonic combat aircraft. MiI Bureau, originally founded by Mikhail L. MiI, is another helicopter organisation. It builds larger aircraft than the Kamov Bureau, such as the MiI Mi-26 vehicle-carrying, eight-bladed-Rotor helicopter.

Design Bureaux

Myasischev Bureau is responsible for strategic long-range bombers and other aircraft, including the Bison maritime reconnaissance aircraft often seen around the Atlantic shores of Western Europe, where it is intercepted and escorted away by Nato fighters.

Sukhoi Bureau is another major fighter producer, whose latest development appears to be the Sukhoi Su-27 supersonic all-weather fighter, believed to be comparable to the U.S. McDonnell Douglas F-15 Eagle.

Tupolev Bureau, one of the most famous of all Soviet design bureaux, is responsible for bombers and transport aircraft, including the Tu-22M Backfire swing-wing supersonic bomber. It has a new swing-wing bomber, Nato code-named Blackjack, new under development. Little is currently known about this aircraft, although one of them was photographed over the Ramenskoye flight test centre late in 1981.

It was announced last year that Tupolev was also preparing a design for a new medium-range jet transport aircraft.

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Vehicles being loaded into a Soviet MiI Mi-26 heavy-lift helicopter. The MiI Mi-26 is the heaviest helicopter yet flown anywhere in the world, and has set a number of world records for lifting heavy payloads to great heights—for example, on February 2 1982, it lifted a 16,000 kg payload to 26,997 ft. Powered by two Lotarev D-136 turbo-shaft engines, the Mi-26 is also the world's first helicopter to have an eight-bladed main rotor.

designated Tu-304, to replace the ageing Tu-154 three-engine airliner of which several hundred have been built. The Tu-154 is a familiar sight at Western airports.

Finally there is Yakelev Bureau, which specialises in smaller transport aircraft such as the Yak-42 three-engine medium-range airliner. It also builds combat aircraft, such as the Yak-36MP Forger vertical take-off fighter for naval duties on board aircraft carriers.

The fact that the Soviet aerospace industry supplies the entire needs of Aeroflot, the mas-

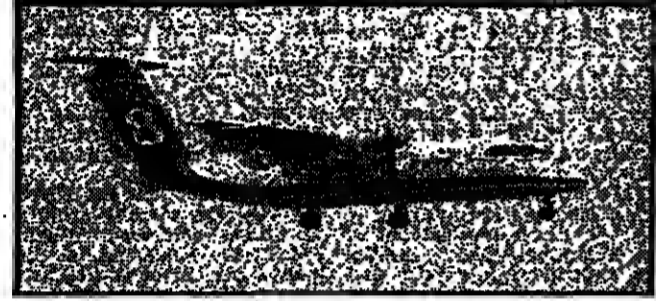
sive Soviet airline which carries both throughout the USSR and internationally a total of well over 100m passengers a year, indicates that transport aircraft production alone is substantial. At the same time military aircraft are built in many hundreds.

Soviet missile technology has also expanded swiftly in recent years. Coupled with increased space ventures, both manned and unmanned, it is probably spear-heading the advances of Soviet aerospace technology as a whole.

Although the Soviet Union has not yet produced an equiva-

lent of the U.S. Space Shuttle manned re-usable space transport system, it is known that it has ideas for such a development and that experimental work on small-scale test vehicles has been done.

It may not be long before more definitive information on such a venture emerges, and that by 1990 such a vehicle will be used by the Soviets to carry men and supplies into orbit to help to construct the large, permanently-manned Earth orbiting space station which is believed to be under development for deployment in the early 1990s.



The twin-engine Dash 8 turboprop is the latest regional and commuter airliner to emerge from de Havilland Aircraft of Canada, long famed for its line of quiet short-take-off-and-landing passenger aircraft.

Federal funding in Canada

CONTINUED FROM PREVIOUS PAGE

the current rate. Marketing reviews had confirmed that there was a "very large potential market," which the company intended to attack.

Pratt and Whitney Canada is now the world's leading manufacturer of small gas turbine engines for business and commuter aircraft. Its engines are also used in helicopters and industrial applications, with manufacturing centred in Canada.

New engines for business and commuter aircraft in 1983 accounted for about 45 per cent of PWC's sales, lower than normal because of the depressed state of the industry through the recession. Total after-sales support represents 40 per cent of PWC's business, growing in importance because of the increasing in-service engine population.

The remaining 15 per cent of sales relate to industrial gas turbines, marine systems and other equipment. PWC's main competitors are Garrett, General Electric, and Allison, all of the U.S., and Rolls-Royce of the U.K.

The recession dramatically cut industry demand for small airliners in 1982 and continued in 1983. Estimated world-wide deliveries of turbo-prop and jet aircraft by U.S. manufacturers for civil or para-military uses fell from 1,782 in 1981 to 1,065 in 1982, and further to 750 in 1983. As a result, PWC's 1983 sales fell to C\$400m, and operating profits declined.

Even so, the company says much progress was made in 1983. Foremost was an agreement with the Canadian Federal Government to provide C\$230m in repayable support towards PWC's five-year C\$855m research and development effort. The Canadian Government supported R and D programmes will include advanced versions of existing engines, and a new engine for Bell's new Canadian helicopter and other applications.

PWC won 11 of the 15 new engine competitions it entered in 1983, its engines being selected for the new Beechcraft Starship I executive aircraft, the Cessna Caravan I and II, a Cessna military trainer, the new Fokker F-50 airliner, the Mitsubishi Diamond executive aircraft, and the Learjet/Rinaldi Piaggio GP-100 joint venture.

PWC says that during the next five years, with an average annual growth rate of about 20 per cent, demand for small gas turbine engines for small airliners, executive aircraft and military trainers should rise to more than C\$1.5m. But this growth begins from a low 1983 base, and in part will result from the rapid growth of regional airlines in the U.S. resulting from the air transport deregulation there.

growth will be increased military demand for new aircraft, a growing civil helicopter market, development of overseas markets, especially in the Third World, and greater demand for business aircraft.

Turbo-prop engine sales are expected to grow at an annual rate over the five years of 15 per cent, to C\$3.5bn, and PWC expects a big share of this market with its PT-6 and PW-100 Series turbo-prop engines.

The PT-6 powers such aircraft as the Shorts 330 and 360, de Havilland Canada's Twin Otter and Dash 7 airliners, while the new PW-100 Series in various models will be used in a wide range of aircraft.

These will include such airliners as the DHC Dash 8, the Brazilian Embraer Brasilia, the Aerospace/Aeritalia ATR-42, Fokker F-50 and the British Aerospace Advanced Turbo-prop (ATP).

The market for turbo-shaft engines for helicopters is expected to total about C\$5bn over the next five years, growing annually at about 26 per cent. PWC participates in this market segment with a turbo-shaft version of the PT-6 in Bell and Sikorsky aircraft.

A new series of turbo-shaft engines, the PW-2000, is under development, while the company is also working on an advanced turbo-prop/turbo-shaft engine, the PW-3005, as a potential power-unit for prospective military helicopters and for re-engineing existing military helicopters and patrol aircraft which have a high fuel consumption.

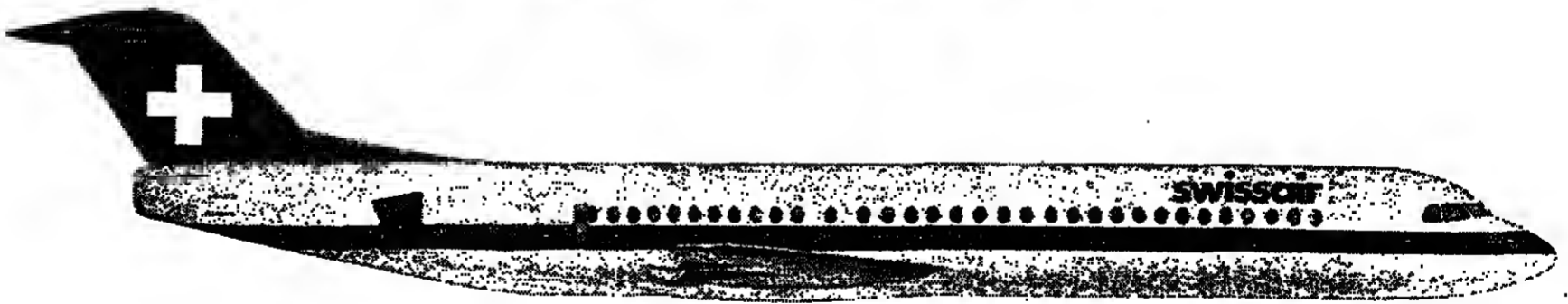
The PW-3005 also has potential for civil ground-based applications in the 1990s. In turbo-fans (jets) the market is expected to grow at an average annual rate of 15 per cent, and total about C\$5bn. With its PT-16D turbo-fan in the 2,000-3,250 lb class, PWC has a wide market.

This is expected to expand as new, faster turbo-fan-powered aircraft now being considered are produced to compete with the higher speed turbo-prop aircraft currently under development.

PWC says its strategy for the turbo-prop and turbo-fan market is to increase its share of the civil engine categories, establish a significant presence as a supplier of U.S. military engines, and to penetrate the turbine-powered helicopter market. The Canadian Federal Government's support for R and D ventures will help PWC on no fewer than 12 projects over the next decade, including further development of the PT-6 and the new PW-100 turboprop and the new PW-2000 series turbo-shaft engines for helicopters.

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AEROSPACE 14

Civil and military ventures ensure healthy workload

The UK

MICHAEL DONNE

THE PAST YEAR has been a good one for the UK aerospace industry, with a number of major new ventures launched in both civil and military aircraft and in guided weapons. For the immediate future, several other major new ventures are on the verge of Government decisions which, if favourable, could ensure for the UK a substantial aerospace workload through the rest of the 1980s and beyond.

One indication of the improving situation in the industry is that at June 30 this year, the order book of British Aerospace, the aircraft, missiles and space group, stood at about £5.5bn against £4.5bn at the end of 1983. BAE's sales in the first half of this year amounted to about £1.08bn, against £1.04bn in the corresponding period of 1983. BAE's pre-tax profits in the first half were estimated at £55m, against £36.5m in the same period of 1983.

The major new ventures already launched include development of the European A-320 150-seater Airbus, to help complete the family of commercial airliners coming from the Airbus Industrie consortium. The UK Government is providing £250m towards the UK's share of the costs of this venture, leaving British Aerospace (which is building the wings for the A-320) to find more than £400m from its own resources to complete the UK's overall share. The A-320, with French, West German and Spanish participation, is due to enter service in 1988.

Along with that decision, the UK Government has also subscribed £60m for the Rolls-Royce share of the new international Aero-Engines consortium's V2500 engine, destined to power not only the Airbus A-320 but also any other new-generation 150-seat airliners that may emerge in the mid to late 1980s. Rolls-Royce has a 30 per cent share in this venture, as has Pratt and Whitney of the U.S., with other participants including Fiat Aviazione of Italy, Motoren-und Turbinen Union of West Germany and Japanese Aero-Engines, representing the three major Japanese aero-engine manufacturers.

At the same time, the Government has subscribed further launch aid to help

Rolls-Royce continue to develop the advanced E-4 version of its RB-211-535 engine, currently used in the Boeing 757 twin-engine jet airliner.

Rolls-Royce itself has also launched a new engine, the RTM-322, in conjunction with Turbomeca of France, which is initially intended as a contender for the power-plant contract for the big EH-101 Anglo-Italian civil and military helicopter, now under development both for commercial use, and as a replacement for the Sea King in the RAF and Royal Navy, and for use by the Italian Navy. The Government is subscribing up to £80m towards the cost of the commercial version of that helicopter, with the funds for the military version being borne on defence votes.

On a private venture basis, British Aerospace, in addition to financing its share of the A-320, is also subscribing up to £100m for the development of the new Advanced Turbo-Prop (ATP) twin-engine airliner, a 64-seater to complement the smaller 748, which itself continues to sell well, and which is being progressively improved so as to continue in production for some time to come.

Private venture

BAE is also funding a private venture the further development of the Type 146 four-engine jet feeder-liner, with a Series 300 version seating 125 passengers now being seriously considered, and likely to be given the go ahead soon, while the smaller 80-100 seater Series 100 and Series 200 versions continue in production.

At the same time, BAE is continuing development of its existing Jetstream 31 twin turbo-prop aircraft; and its twin-engine Type 125 business jet. Its overall spending through the rest of this decade on continued development of its civil aircraft range will thus amount to several hundred million pounds.

Looking further ahead, British Aerospace is continuing to build the single "demonstrator" in the UK's own Experimental Aircraft Programme, as a forerunner of a new tactical combat aircraft for the early 1990s to replace the ageing Jaguar aircraft. This EAP is expected to fly in 1986, but well before then it is hoped that it will have become the effective prototype of a wholly European Fighter Aircraft (EFA) programme embracing



The British-designed and built Turbo-Firecracker, by NDN Aircraft of the Isle of Wight, is being offered by Firecracker Aircraft (UK) as the British entrant in the RAF's new basic trainer contest. The aircraft is already on order for training use by Specialist Flying Training of the UK. Right: The British Aerospace BAe 146 four-engine jet feeder-liner is now in

the West German, French, Italian and Spanish aerospace industries in addition to the UK.

Even if earlier difficulties in reaching agreement on a common programme eventually prove insuperable, preventing the kind of European collaboration that most aerospace industry leaders want to see, the existence of the advanced EAP in the UK, which is being jointly funded by both the UK Government and the industry (including British Aerospace, Rolls-Royce and several of the major equipment companies), will ensure that if necessary the UK could go ahead either alone or with a smaller international consortium than originally envisaged.

Several other major programmes are likely to result in decisions in the not too distant future, which will also help to swell employment in the UK industry, and keep its design teams busy into the 1990s.

Work worth £200m

One is the decision on which aircraft to buy as the next basic trainer for the RAF, to replace the ageing Jet Provost. There are four contenders for a 155-aircraft, £200m RAF contract. They are the British-built Firecracker, the Brazilian-built Embraer Tucano, which if selected would be built in its entirety in the UK by Short Brothers of Belfast; the Swiss-built Pilatus PC-9, which if selected would be 50 per cent

built in the UK by British Aerospace, the remainder being built by Pilatus, either in Switzerland or in its own UK factory at Bembridge in the Isle of Wight; and the Australian Wamira II, which if selected would be built in the UK by Westland Aircraft of Yeovil.

Whichever way the RAF's decision goes, therefore, some part of the UK aerospace industry will benefit by some £200m of direct aerospace manufacturing activity.

In addition, there will be substantial support costs over the 20-plus years' life of the basic trainer in RAF service, with a substantial volume of equipment being provided by the ancillary and component industries.

Yet another decision evoked is on the provision of a new tactical transport helicopter for the RAF, to replace the ageing Wessex. Here also the order is likely to be for up to 125 aircraft worth well over £200m, to meet what is called Air Staff Target 404. Three aircraft are in the running — the Westland Lynx multi-role helicopter; the U.S. Sikorsky S-70A Black Hawk, already extensively used by the U.S. armed forces; and the French Aerospatiale Super Puma. The new Rolls-Royce/Turbomeca RTM-322 engine could be used to power any of these aircraft, and it is considered certain that whichever one is chosen will be required to adopt the RTM-322, with a

quantity production to meet the requirements of regional and commuter-type airlines throughout the world. The aircraft has already been sold extensively into the U.S. and elsewhere, and production is geared to increase next year, to meet the rising order book. The aircraft is shown over San Francisco in the colours of Pacific Southwest Airlines of the U.S., one of the biggest buyers.

substantial further quantity of UK equipment being installed.

In all of these aircraft ventures, the one significant fact that emerges is that international collaboration is involved. The heavy costs of design, development and manufacture of any new aerospace product, whether civil airliner, combat aircraft, helicopter or aerospace engine, now virtually preclude single-company and even single-national activities. The more international companies, and governments, that can be brought into any venture, the wider the ultimate production runs of the finished product, and the wider the burden of costs can be spread.

The UK has always been a strong proponent of international aerospace collaboration — Concorde, Airbus, the Jaguar and Tornado military combat aircraft, the Anglo-French helicopter programme and many missile and engine ventures — all illustrate its willingness to collaborate.

UK invests £370m

International collaboration is increasingly becoming the only way ahead for new, very high cost civil and military aircraft, missile and space programmes, either already under way, or mooted for the future. Despite the real difficulties in achieving effective international collaboration — such as the higher infrastructure costs involved, the differences of language, and the need to suppress intense

desires for project leadership that bolster individual national pride — the real benefits of cost-sharing, and bigger production runs, are such that more and more programmes will become international.

The other major factor behind these programmes is that they are intended to be wealth creators, not wealth consumers. Each and every one, other than the military ventures (and even many of those), are expected to find major export markets, so as to justify the money spent on them. The UK Government, whose combined investment in new commercial aerospace ventures announced in 1984 alone exceeds £370m, expects commercial returns on its money.

The UK's other major fixed-wing aircraft manufacturer, the state-owned Short Brothers of Belfast, continues to flourish across a wide field of activities, covering fixed-wing aircraft, guided weapons and aircraft components of many kinds.

In aircraft, the company builds a "family" of small, light transport aircraft, ranging upwards from the Skyvan freighter, through the Type 330 30-seat and larger Type 360 36-seat twin-turbo propeller engine commuter airliners, with freighter and military variants of which to date total sales amount to more than 400 aircraft. Earlier this year, the company won a contract for the supply and support of 18 Spheria freighters (a variant of the 330)

from the U.S. Air Force, with an option on another 48, worth in all over \$660m. The first Spheria was rolled out of the Belfast factory recently.

Shorts has been investing in recent years at a rate of up to £25m a year in new technology and capital equipment, and this has enabled it to widen its product range substantially, especially in the "aerostuctures" field, involving manufacture of parts for other aircraft. The company builds engine pods for the Rolls-Royce RB-211 engine, and recently won a contract to design, develop and manufacture the "super-critical" wings for the new Fokker F-100 twin-jet airliner, thereby continuing an association that has involved making wings for the F-28 with jet for many years. Other components built by the company cover inner wing-flap assemblies and nacelle nose cowls for the Boeing 737, main landing gear doors and nose cowls for the Boeing 747, and complete nacelles for the BAe 146 regional jetliner.

Shorts is also planning with Embraer of Brazil to be responsible for the manufacture in the UK of the Tucano basic trainer, if that is selected for the RAF, but of equal significance is the agreement with Embraer to design and probably also manufacture the next generation of commuter airliner that will follow the 360 and Embraer Brasilia in world markets in the 1990s — another example of international collaboration that could have far-reaching consequences.

Shorts is also a major company in the guided weapons field, and claims the distinction of having supplied guided weapons systems to more countries than any other British manufacturer. The Seacat and Tigercat missile systems are used by over 20 nations, and the Blowpipe shoulder-launched missile has been selected by 16 armed forces in 11 countries.

An advanced development of the Blowpipe, called Javelin, was announced last year, and earlier this summer a further contract was from the Ministry of Defence worth over £35m, bringing to air missile systems, of Javelin to date to over £120m.

The UK industry also includes a handful of smaller fixed-wing aircraft manufacturers, who nevertheless make a significant contribution especially in the construction of small, light military and commercial types.

Of these, the largest is Pilatus Britten Norman, of Bembridge in the Isle of Wight now owned by Pilatus of Switzerland, building the range of civil and military Islander twin-engine light transports. Also in the Isle of Wight is NDN Aircraft, which has built the Turbo-Firecracker military trainer now on offer to the RAF as a possible basic trainer to replace the ageing Jet Provost, and which is being marketed by Firecracker Aircraft (UK). NDN has also developed an agricultural aircraft, the NDN-6 Fieldmaster.

Also now making a significant contribution to export sales is the Edgley Optic, built by Edgley Aircraft at Old Sarum, near Salisbury. This unique fixed-wing three-seat observation aircraft has been nicknamed "Bug-eye" by many because of its large, bubble cabin providing a wide-angle view, which in conjunction with the aircraft's slow flying speed makes it highly suitable for surveillance roles of all kinds — such as police, customs, coastguard duties, pipeline inspection, and aerial photography.

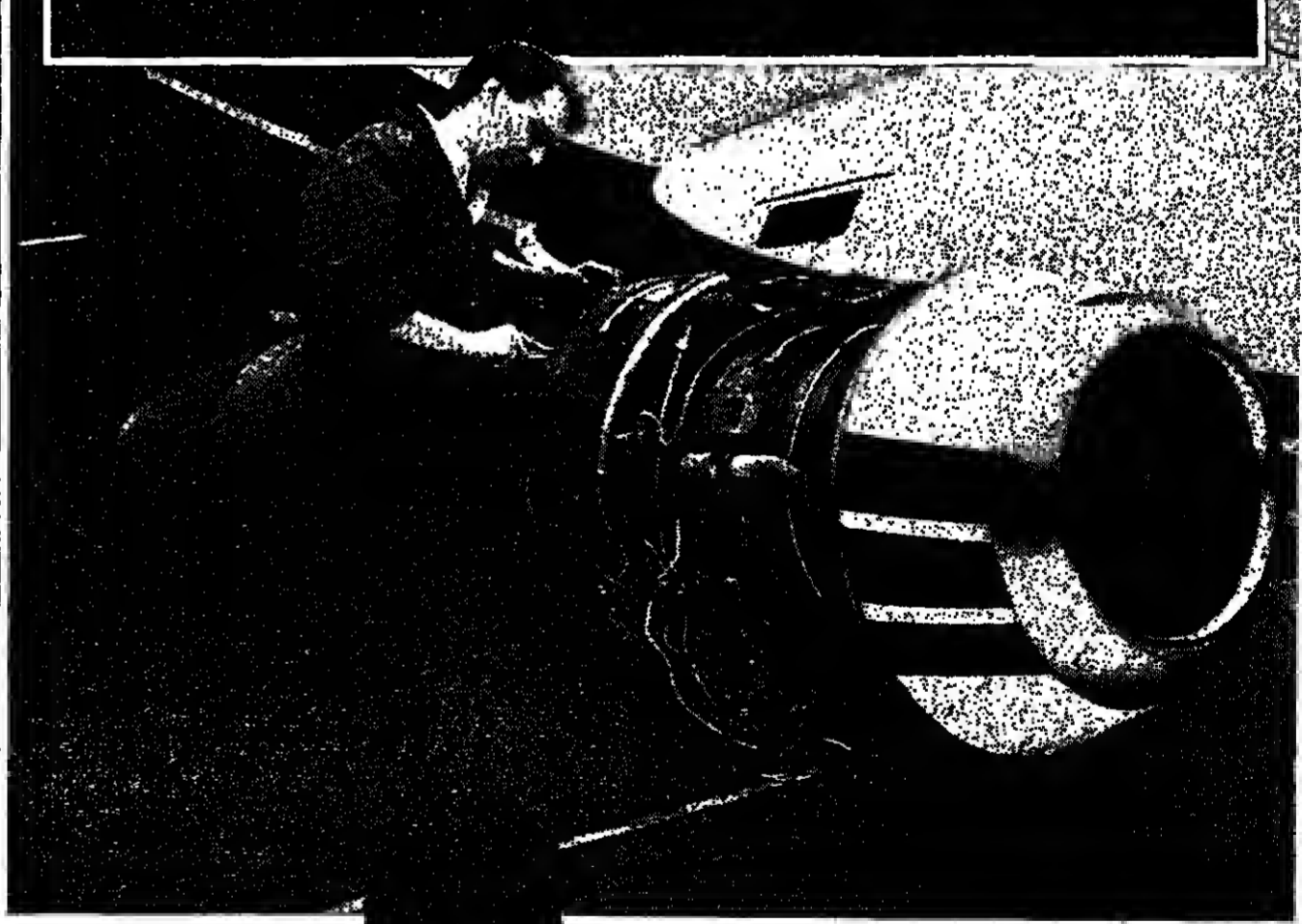
Silingsby Aviation, at Kirby-mooraine in Yorkshire, manufactures the T-67 light trainer, with especially emphasis on the T-67M Firefly 160, a two-seat military basic trainer version. Silingsby also makes the gondola and propulsion ducts for the Airbus Industries' Skyship 500 airship.

Delays in U.S.

Efforts to establish a production line in Northern Ireland to build the U.S.-designed Lear Fan twin turbo-prop business aircraft making extensive use of composite materials, such as graphite/epoxy, have been severely delayed owing to design and development problems with the prototype in the U.S.

The UK also now has a small but vigorous airship manufacturing company, Airship Industries, which has already built a number of small 15-seat Skyship 500 craft, with craft already delivered to customers in the U.S. and Japan, while it is also now developing the larger, 20-passenger Skyship 600. One of the company's Skyship 500s has been used over Los Angeles for TV coverage of the Olympic Games. Airship Industries, which is now controlled by Mr Alan Bond, an Australian entrepreneur, is seeking additional UK Government funding to help develop larger airships.

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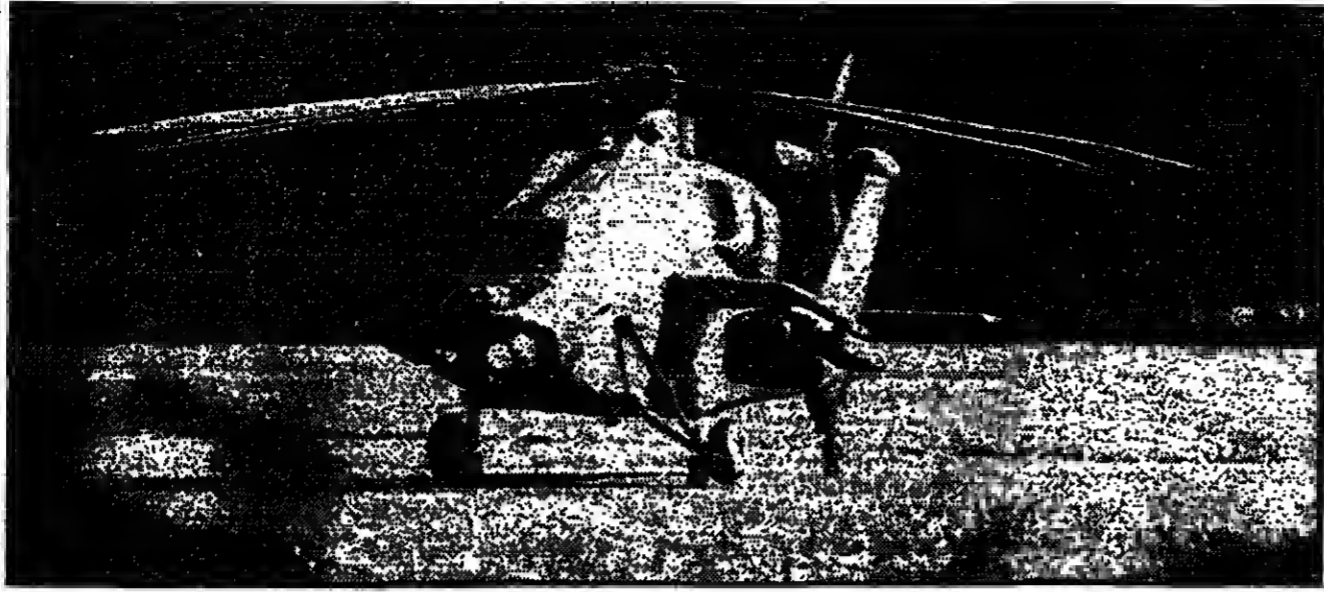
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Aerospatiale of France and Messerschmitt-Bölkow-Blohm of West Germany are jointly developing the PAM-2/HAC anti-tank helicopter gunship. A total of over 330 helicopters is envisaged in this programme, one of the major new helicopter programmes now under way on this side of the Atlantic (another being the UK-Italian Westland-Agusta EH-101 Sea King replacement aircraft, with a commercial variant).



Communities vie for helicopter offset work

Belgium
PAUL CHESTERIGHT

THE leading Belgian aerospace companies are searching for new products to lessen their dependence on military and other Government contracts. The general recession in the industry has again shown how vulnerable is a sector that depends largely on sub-contracting work or component manufacture for projects conceived abroad.

But the increasing need for the world's airlines to renew their fleets and the extensive work being done internationally on new types of aircraft offer a hope to set against the fact that the three companies on which the Belgian industry is built have all suffered or expect to suffer lower profits.

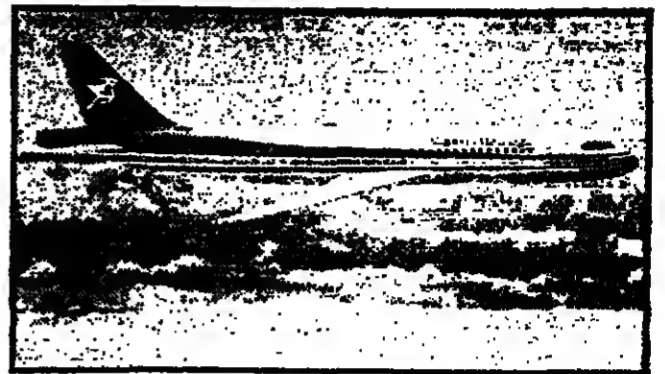
These three are Fabrique Nationale (FN), the old-established armaments and engines group; SA Belge de Constructions Aéronautiques (Sabca); and Société de Construction Aéropatiale (Sonaca).

State funding

The problem is that the weakening effects of the recession have exposed financial difficulties that have made almost inevitable some degree of state funding if the companies are to take part in the research and development activities that assure their future.

But state funding in Belgium is not simply a question of deciding industrial priorities. The communal and linguistic division of the country necessitates the provision of funds equitably between the Flemish speakers of the north and the French-speaking Walloons in the south. This is not a new problem in Belgium.

The key test will come when the Government starts over the next few months active negotiations to buy a new fleet of helicopters for the Belgian armed forces, and Flemish interests in the north are already claiming 100 per cent of the expected cost. But traditionally the arms industry has been based in Wallonia, particularly at Liège.



The A-320 twin-engine 150-seater is the latest model of the Airbus to be put into development by Airbus Industrie. In addition to the principal partners from the UK, France, West Germany and Spain, there are associates such as Belairbus of Belgium and Fokker of Holland. The A-320 will enter service in the spring of 1988. Cyprus Airways is one of the early purchasers of the aircraft.

Collaboration's charms grow

France
DAVID MARSH

THE FRENCH aerospace industry is guarding against a mood of celebration following its two successes earlier this month: another flawless launch of the Ariane space rocket and the placing of France's first commercial telecommunications satellite, Telecom 1.

Back on the ground there is much room for caution about the future. This is underlined by the sharp swing into a FFr 358m loss for 1983 at the prime aerospace company, the state-owned Aerospatiale, and the 46 per cent plunge in orders received by the aeronautics industry last year.

Summing up the feeling that the French aerospace sector is still not out of its bout of turbulence, General Jacques Mitterrand, president of the industry's professional association, Gias, has recently expressed fears that last year's stagnation is continuing in spite of a pick-up in activity in some sectors like civil aircraft engines.

Last year the French aerospace industry achieved a turnover of FFr 60.3bn, roughly the same as 1982. With exports last year totalling FFr 33.6bn, 65 per cent of sales, the sector is more than ever exposed to the winds

of world competition. It is also becoming increasingly involved in politically and commercially complex questions of international collaboration deals so as to ensure an acceptable volume of future orders.

With the French military and civil market clearly too narrow to satisfy the manufacturers' ambitions, and orders of fighter aircraft and other military equipment to traditional clients in the Middle East falling off as a result of lower oil prices, French aerospace companies are turning ever more closely to European collaboration deals.

Losses

Aerospatiale, as the prime industrial contractor for Ariane, and with more than 25 years of co-operation with Messerschmitt-Bölkow-Blohm (MBB) in civil aircraft, missiles and satellites, is no stranger to European link-ups.

But it is significant that all this year's milestones in French aerospace concern European deals where governments and industries are trying to act in harmony to stand up to U.S. competition.

They include the go-ahead at the beginning of March for the next A-320 generation of Airbus; the agreement in May for joint construction of a Franco-German anti-tank helicopter; and the five-nation accord in July to press ahead with feasibility studies for a European fighter aircraft for the 1990s.

Waiting in the wings are other possible deals such as a possible multi-national follow-in to the Transal military transport aircraft, where Aerospatiale, British Aerospace, MBB and Lockheed have already formed a joint study group.

In addition, the accord reached between Paris and Bonn in May previews joint studies of a military observation satellite, furthering the existing Franco-German collaboration in civil satellites, while Paris hopes that the two-nation combat helicopter deal could eventually include Britain as well.

"One can no longer develop big projects except through international collaboration," says M Jean-Charles Poggé, Aerospatiale director in charge of strategic planning and budgets.

He compares building up foreign collaboration to mixing a good mayonnaise, starting off with well-ried partners such as West Germany and adding new ingredients gradually, so as not to spoil the mixture.

Satellites

Aerospatiale's problems last year—when it dipped into the red for the first time in five years and more than doubled its debts to FFr 4.6bn—reflect a combination of difficulties. They include poor sales of

the A-300 and A-310 Airbuses, where the company has made extra provisions to cover increasing stocks of unsold aircraft, a continuing slump in U.S. helicopter sales, and declining profits in the one division which best resisted the previous year's downturn—tactical missiles (including the famous Exocet). Overall orders last year dropped 18 per cent to FFr 12.9bn.

Aerospatiale expects a gradual improvement in business this year, with orders in the first five months of the year up 54 per cent over the same period of 1983. But compared with its foreign competitors notably Boeing, Aerospatiale will continue to suffer higher costs as a result of its extremely limited scope for workforce cuts.

Dassault-Breguet, the state-controlled military fighter manufacturer, which makes the celebrated Mirage, also suffered a sharp fall in orders last year—down more than 30 per cent to FFr 20.7bn, above all because of a drop in military exports.

But Dassault-Breguet, in which the Government has a 49 per cent stake, nonetheless recorded net profits of FFr 394m (FFr 522m in 1982) and was able to increase its dividend to the state. It is one of the few state-controlled groups which actually gives a return to taxpayers. The first of the new Mirage

2000 jets has just entered service with the French Air Force, while Greece has given a shot in the arm to export prospects by announcing a prospective purchase of 40 fighters.

Dassault-Breguet has also just unveiled its new Falcon 900 luxury executive jet, designed to boost its position on the civil market. It has faced complaints from U.S. aircraft makers about allegedly unfair French Government support for the Falcon development.

M Benno-Claude Vallières, the doctory 73-year-old chairman of Dassault-Breguet, reports that government support for his company—as with Aerospatiale—is in the form of repayable loans; and he points out sharply that the Falcon actually gives employment to the U.S. aircraft industry through engine and equipment purchases.

In another international tussle, in the fighter project with Britain, West Germany, Italy and Spain, Dassault-Breguet has made a strong pitch for overall technical leadership.

The preliminary accord in Madrid last month has by no means ended the dispute between Dassault and British Aerospace on this issue. Ministers will also have to decide whether a British or a French engine will be used to power the fighter before final accord can be reached.

A report from Gulfstream Aerospace Corporation on a new concept for increasing a nation's surveillance and reconnaissance capabilities with a single affordable and versatile aircraft type.

How to achieve flexibility and cost-effectiveness in airborne information-gathering systems:

The need: In today's political, economic and social environment, every country, large or small, has a need to know what is taking place along or near its national boundaries.

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Unaffected by weather conditions or darkness, these systems not only permit passive information-gathering missions to be conducted over wide areas from high altitudes, but also from within the security of a nation's own borders when the occasion demands.

Their effectiveness, of course, is directly related to the capabilities of the platform which carries them.

It stands to reason that the most suitable aircraft for conducting such vital missions would be one with sufficient size to carry the equipment and operators, several hours of endurance, fast cruise and dash speeds, high operating altitudes, good handling characteristics in all flight regimes, and unquestioned dependability of engines, flight systems and airframe.

Ideally, it also would have affordable acquisition costs, and be cost-effective in its operation, maintenance and support.

Gulfstream Aerospace has developed exactly that platform: the Gulfstream SRA-1.

The solution: The Gulfstream SRA-1 is a specialized derivative of the highly successful Gulfstream III executive jet transport, of which nearly 150 are in service with many of the world's leading corporations and governments.

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The Gulfstream SRA-1 can be made available with fully integrated systems designed to satisfy the operator's requirements for one or more of the following missions: (1) Electronic Surveillance; (2) Reconnaissance; (3) Maritime Patrol and Surface Surveillance; and (4) Anti-Submarine Warfare (ASW). In addition to providing a basic mission capability, the Gulfstream SRA-1 can be reconfigured rapidly to fly any of several support missions: VIP transportation; Personnel/Administrative Transport (seating for 18 passengers plus attendant); Medical Evacuation (15 litter patients plus medical staff); and Priority Cargo (over 6,000 pounds/2,700 kilograms).

The proof: The concept of using the basic Gulfstream airframe for missions other than executive transport has been convincingly demonstrated by the Royal Danish Air Force, which operates specially equipped Gulfstream jet aircraft for maritime surveillance, fishery inspection, medical evacuation, priority cargo and administrative transport.

In these applications, the aircraft has proven that it can effectively perform missions that require any combination of endurance, size, speed and performance flexibility under the broadest range of operating conditions.

The aircraft: While it retains this unique versatility, the Gulfstream SRA-1 capitalizes on the long range, high operating altitudes and stable flight characteristics of the basic Gulfstream aircraft to provide an ideal platform for the most sophisticated airborne surveillance and reconnaissance systems, either electronic or optical, or both.

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wide range of conditions, such as hot days and higher elevation airports.

• Engine reliability: Rolls-Royce Spey Mk511-3 turboprops combine extremely high levels of in-flight and on-time departure reliability with excellent cruising fuel efficiency at airliner speeds above 40,000 feet (12,192 m) and offer maximum operational flexibility throughout all flight regimes.

• Cabin size and environment: A flat floor and over 6 feet (183 cm) of headroom extend the entire length of the cabin, or nearly 42 feet (12.8 m). Cabin volume totals approximately 1,500 cubic feet (42.5 m³). A superior pressurization system maintains cabin altitude at only 6,500 feet (1,981 m) at 45,000 feet (13,761 m) to enhance physical well-being and efficiency of the crew on longer missions at higher altitudes.

The evaluation: We are confident that a thorough examination of the Gulfstream SRA-1 will show that it can meet all of your present and future requirements for an efficient, affordable surveillance/reconnaissance aircraft.

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The Gulfstream SRA-1 is the answer.

The Gulfstream SRA-1 will be on display at the Farnborough Air Show, Farnborough, England, September 2-9, 1984.



Fokker draws new breath

The Netherlands
WALTER ELLIS

THE announcement late last year that Fokker, the leading Netherlands aerospace group, was to develop two new aircraft, the Fokker F-50 prop jet and the Fokker F-100 jetliner, breathed new life into the company at a time when its long-term decline was beginning to seem inevitable.

While the tried and trusted F-27 and F-28 airliners were—and are still selling, and the assembly of U.S.-designed F-16 fighters was going well, it was clear that the 1980s would require new aircraft.

The two new Fokkers are now providing the basis for production well beyond the year 2000. Fokker has also kept up its interest in space projects, often in co-operation with other high-technology Netherlands companies, so that the country retains an active involvement in satellite development and space probes generally.

On a personal level, a Dutch scientist, Dr Wubbo Ockels, has joined the crew of the American space shuttle Columbia, and is due to take part in a seven-day mission next year.

Dr Lodewijk van deo Berg—now a naturalised American—will join the crew of Spacelab 3 next January and is to conduct

chemical experiments in space over a long period.

IRAS, the infra-red astronomical satellite developed jointly by the Netherlands Agency for Aerospace Programmes, NASA of the U.S. and the UK's Science and Engineering Research Council, proved a considerable triumph for Netherlands technology before "expiring" last November.

Now there are tentative plans to revive it. A shuttle mission in 1988 could yet restore it to full working order and enable it once more to see through clouds of dust and gas deep into the Galaxy.

Hollandse Signaal, a subsidiary of Philips of Eindhoven, is also involved in satellite technology, while DAF, the heavy vehicle manufacturer, now has a stake in the aircraft industry through repair and maintenance.

More than 30 other Netherlands companies—many of them small—make their own, sometimes highly specific contributions using the services of the Eindhoven-based Netherlands Aerospace Group.

The F-100 should enter service a year later, in mid-1987, and will carry up to 107 passengers over 1,200 nautical miles at a speed of Mach 0.750. Its wings, described as "supercritical," while have an area 18 per cent greater than those of the F-28 and are designed to produce a 30 per cent improvement in aerodynamic efficiency.

Power will be provided by two rear-mounted Rolls-Royce Tay jet engines to be 15 per cent more economical than their predecessors.

In both aircraft, advanced composite materials, on which Fokker has been working for several years, will provide greater strength with less weight. Avionics, hydraulics, landing gear and air-conditioning will all be of the latest type and various interior plans will be available to customers.

Yet without Fokker the efforts of others would be sadly reduced. From its base beside Schiphol Airport, Amsterdam, Fokker is the nerve centre and fulcrum of the Dutch aerospace effort. The two new civil aircraft it is now developing are expected to be among the most advanced of their kind in the world, embodying the experience gained from the F-27 and F-28 into new programmes involving lightweight composite materials and the latest engines.

The F-50, which is due to enter service in mid-1986, is a twin prop-jet, high-wing aircraft designed to fly at Mach 0.507—12 per cent faster than the F27—over a range of 720 nautical miles with 50 passengers.

The engines will be six-bladed Pratt and Whitney 124s, which are intended to reduce costs per mile by up to 25 per cent compared with current turbo-prop systems.

A launch-order for the F-50

prop-jet before the end of the year is expected.

Swissair, the Swiss national airline, has ordered eight F-100s and has options on six more. KLM of the Netherlands, Scandinavian Airlines system, and U.S. Air, a leading U.S. Independent, have also shown interest in the jetliner.

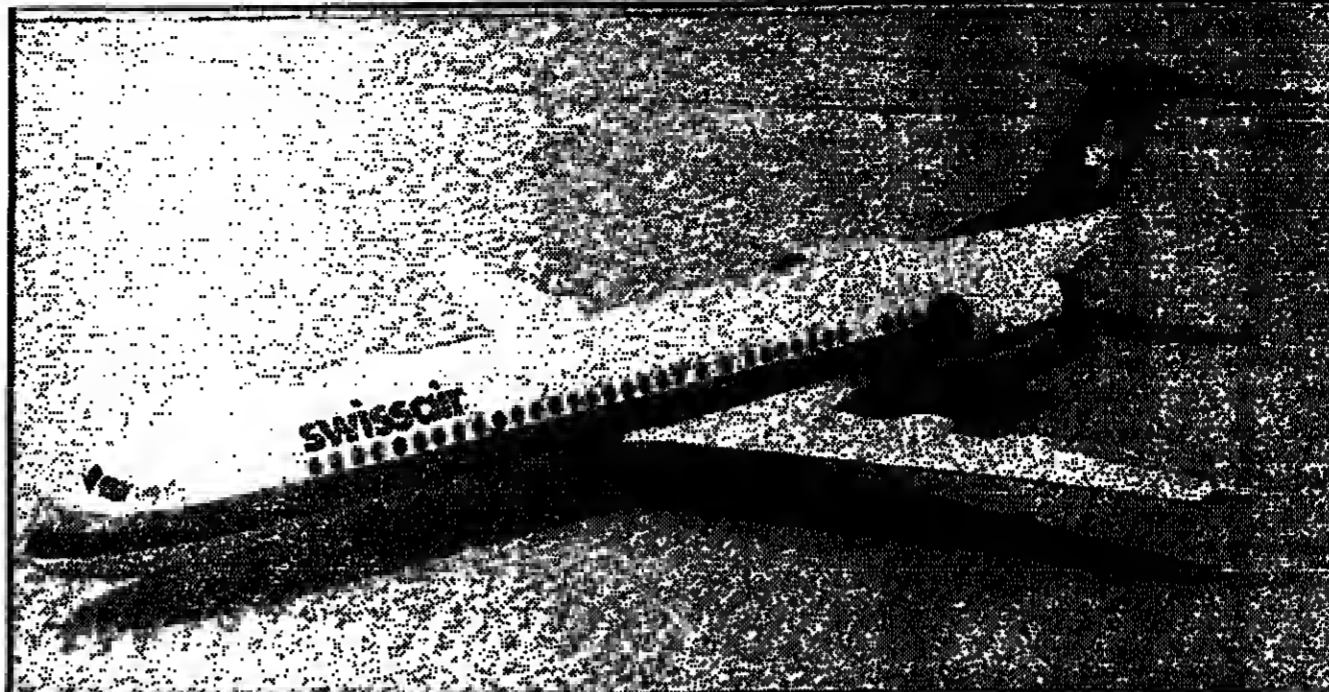
Mr Frans Swartouw, chairman of Fokker, visited Japan in February in a bid to secure participation in either or both of his new projects from Japanese industry. The outcome, in July, was a contract with Fuji for the supply of tail components for the F-50.

There is also a possibility that all Nippon (ANA) and TOA Domestic Airlines will look seriously at Fokker aircraft as they consider forthcoming fleet re-evaluations.

The Netherlands Government, which is anxious not only to maintain jobs at Fokker but is determined to retain major aerospace capacity in the country, has provided much of the cash for the current programmes.

Loans were agreed in March totalling FL800m. But the company is back in profit in any event, having recorded earnings of FL18m in 1983. It is expected to perform well again this year.

Sales of the F-27 and the F-28 are continuing, while the F-16 programme has been extremely beneficial not only in terms of income but through the addition of valuable skills.



Fokker of The Netherlands has recently won its first order for its new F-100 twin-engine regional jet airliner from Swissair, and is negotiating further contracts. The aircraft is powered by the new Rolls-Royce Tay jet engine, now under development. The Fokker F-100 is one of two new aircraft now under development by the company, the other being the F-50, a twin turbo-propeller airliner seating about 50 passengers. The two aircraft will represent a major investment by the Dutch company in civil aerospace activities for the rest of this century.

Space opportunities beckon

Italy
ALAN FRIEDMAN

THE director-general of Italy's state-owned Aeritalia Aerospace Company, Sig Fausto Cereti, leaned forward in his chair in his Rome office and began sketching a Space Station module on a piece of paper.

"We have just signed a memorandum with Messerschmitt of West Germany to co-operate on the Columbus," he said.

"We believe the Columbus space project could be the European answer to President Reagan's invitation for Europe to participate in the Space Station programme," he added.

Aerospace executives the world over tend to get rather excited when discussing new systems and new products. Sig Cereti, whose Aeritalia has generated a number of new products in recent years, is no different.

He hopes the Italian Government will provide at least \$500m for Aeritalia to join in a \$2bn, European consortium project on Space Station modules. This, in the aerospace business, is exciting.

Less exciting, and perhaps disturbing, has been the lacklustre growth record of the Italian aerospace industry over the past year or so. Recession has meant slower growth for Aeritalia, while Agusta, the other major Italian state-controlled company, has undergone a painful reorganisation.

Last year, Aeritalia's turnover grew only 7 per cent to L267m against an average Italian inflation rate of 15 per cent.

This recession-induced fall in real terms (despite a rise in profits to L110m) was disappointing for an aerospace group involved in a diverse range of products including the Anglo-German-Italian Tornado combat aircraft, the Italo-French ATR-42 turbo-prop commuter aircraft and the newer AMX light attack and battlefield support aircraft.

While the Tornado and ATR-42 programmes are moving ahead, the AMX suffered a setback in June when a test flight resulted in failure and the aeroplane crashed.

Sig Cereti says the crash is being investigated, but he dismisses any talk of a serious

threat to the future of the AMX, which is being developed jointly with Embraer of Brazil. He admits, however, that the crash was not at all good for the image of the AMX.

On the brighter side he predicts that 1984 group revenues will show a 20 per cent rise on last year, bringing total sales to L1,100m, about 20 per cent of Aeritalia's revenues come from sales of commercial aircraft and 70 per cent of sales come from military aircraft, while space-related work accounts for the last 10 per cent.

The group's current order book is understood to be just over L1,000m, roughly equivalent to a year's work. One of Aeritalia's strengths, apart from its generation of new products and its recognised technical skills, is its ability to sell overseas.

Soma 75 per cent of last year's group turnover came from exports, more than the

national average for the Italian aerospace industry.

Total sales made by the industry last year were around L3,600m, of which exports accounted for 12,500m, or 34 per cent. The Italians have succeeded over the last few years in maintaining a healthy trade surplus in this sector. Last year the positive trade balance was around L1,600m.

In addition to the two big state-controlled aerospace groups—Aeritalia and Agusta—there are a variety of smaller companies also making progress. In recent months, for example, Rinaldo Piaggio agreed a joint venture with Gates Learjet of the U.S. to invest \$100m in a business aircraft project, the GP-150.

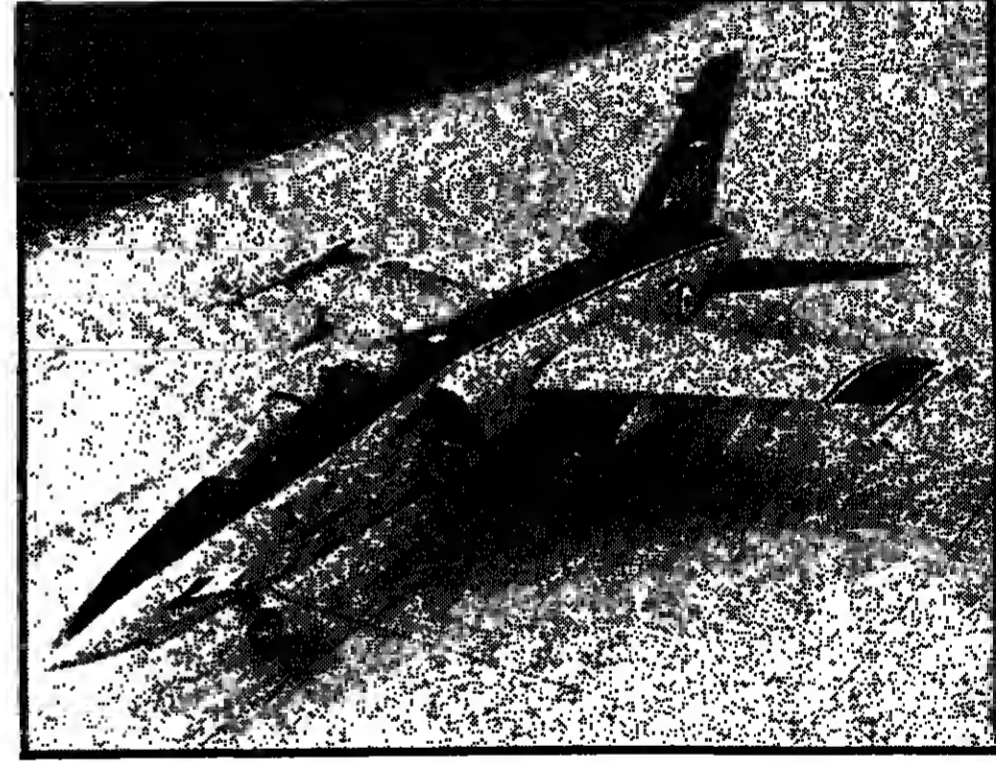
Agusta, which has undergone various financial and management shake-ups of late, does have the prestigious Anglo-Italian EH-101 helicopter project to its credit, however. Last

January the UK and Italy unveiled plans to provide £120m to develop this new military and civilian helicopter.

Participants in the joint project are Westland and Agusta. The British and Italian navies have been keenly interested in order 150 of the military version and the two Governments hope that a total of 900 EH-101 helicopters will be sold eventually.

Agusta's problems, meanwhile, have included a L165m loss last year, the departure of its managing director, Sig Pietro Fasolino, and state-subsidised redundancies for 4,000 of its 10,500 workers. There have also been heavy borrowings, in dollars, and subsequent currency losses.

Now, however, Sig Raffaello Testi, the new managing director, is in charge of a reorganisation programme which should bring Agusta new capital and orders.



The Italian/Brazilian AMX light tactical fighter is now under development by Aeritalia and Aermacchi of Italy and Embraer of Brazil. Although the first prototype was lost in an accident earlier this summer, AMX development is continuing and a second prototype is due to fly soon. The aircraft is expected to enter service in 1987, with initial production of 265 aircraft planned. The power-plant is the Rolls-Royce Spey

U.S. setback forces rethink

Spain
TOM BURNS

LAST FEBRUARY, Construcciones Aeronauticas SA (CASA), received a bitter setback.

Its previously highly successful C-212 Aviocar, a short take-off and landing (Stol) light transport aircraft better known as the "Jeep with Wings" lost a key U.S. defence contract to its rival the Sherpa, built by Short Brothers of the UK.

The contract is to provide aircraft to carry parts and equipment for the U.S. Defense Department in Europe. CASA had high hopes of seeing the C-212 chosen for the European Distribution System Aircraft (Edsa) programme and saw the contract as a toehold in the rich U.S. market.

The failure to clinch the sales breakthrough, which would have accounted for at least 10 per cent of Aviocar production for the next five years, has had a sobering effect on CASA, which is the Spanish national aerospace company.

At one level the management has concentrated on setting its financial house in order. At another CASA is more determined than ever to seek participation in joint ventures and in multinational aerospace projects.

This year Casa did not pay dividends. The Instituto Nacional de Industria (INI), Spain's State holding company, owns 72 per cent of CASA while the Northrop Corporation and West Germany's Messerschmitt-Bölkow-Blohm (MBB) hold respectively 13 per cent and 11 per cent stakes.

A total of 1,600 employees have been laid off for a year under the company's restructuring plans and CASA expects to save Pta 300bn over the current and the next financial years. Capital has been increased by Pta 110.

Forward planning by CASA has concentrated on three specific participation projects and on the prospects for two of its own aircraft, both of which have made their first flights in the past year.

The most ambitious participation venture concerns the joint development by the UK, France, West Germany, Italy and Spain of a European fighter aircraft (EFA)—a scheme formerly known as the Advanced Combat Aircraft (ACA)—which aims to produce a European challenge to U.S. dominance of this sector.

The Defence Ministers of the five countries concerned met in Madrid last month to underline the political commitment to carry the programme through. The scheme is currently at the early design stage and CASA's eventual participation in EFA

is expected to be around 10 per cent.

CASA's continuing participation in the A-320 Airbus programme was increased this year from 4.2 to 5.2 per cent.

Its executives emphasise that more important than the admittedly modest quantitative increase in Spanish participation is the nature of the contribution made to the A-320 project, for CASA is committed to developing advanced technology for the Airbus.

The third participation project emerged in June when CASA signed a Memorandum of Agreement (MOA) with United Technologies Sikorsky Aircraft for long-term industrial co-operation. Under the terms of the MOA, CASA will make major components for Sikorsky's S-70/EH-60 helicopter series and will be involved later in final assembly and in flight tests.

The Sikorsky agreement is complementary to an existing pact between CASA and MBB which permits the production of parts and the assembly of MBB's BO-105 light helicopter in Spain. CASA management is hopeful, however, that the new relationship with Sikorsky will tend towards joint research and development in other helicopter programmes.

While the long-term participation projects take shape the more immediate task at CASA is to follow the success of its two leading products, both of

which were flight-tested in the past year.

One is the 40-seater CN-235 airliner, the encouraging result of a joint venture with the Indonesian aerospace company P.T. Nurjanto. It will be officially demonstrated at the Farnborough Air Show this year.

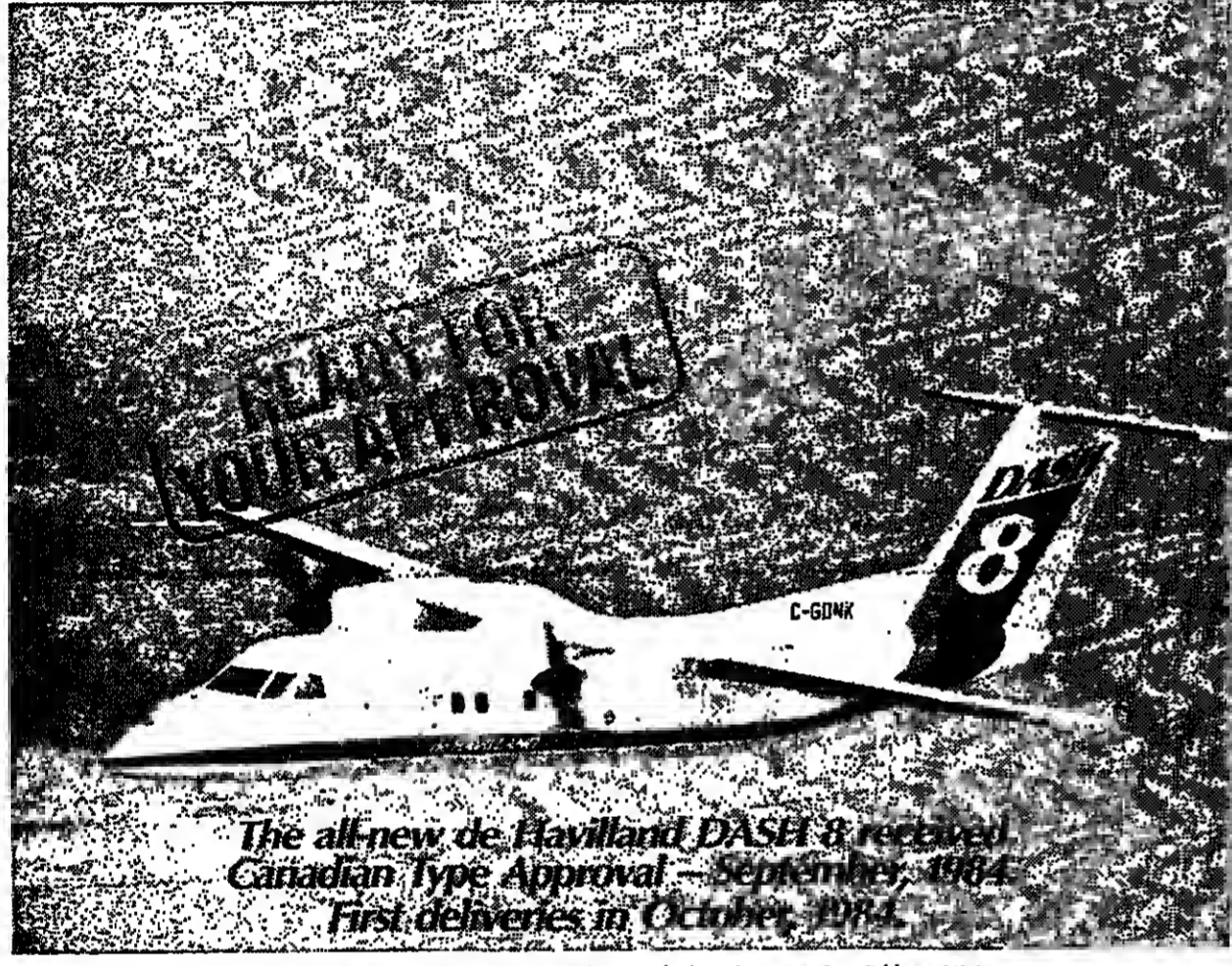
This aircraft is a slightly bigger, faster and more comfortable version of the C-212 Aviocar—a "Range Rover with wings" against the C-212's "Jeep." Both aircraft have won high praise for their sturdiness and versatility.

The CN-235 will be competing directly with De Havilland Canada's Dash 7 and Saab Fairchild's SF-340 among other middle-range turbo-prop passenger aircraft in the commuter/utility category.

Like its competitors, CASA believes that there is a potential market here for 1,900 civil aircraft and 600 more for military duties.

The other product is a new version, the C101-S, of CASA's advanced jet trainer the C101. The new prototype, which has improved avionics and pilot training potential, made its first flight at the end of last year.

CASA is now studying further development of the C101 series and thinking in terms of producing jointly, with Latin American and/or Far Eastern partners, a tactical combat aircraft designed to complement the EFA programme.



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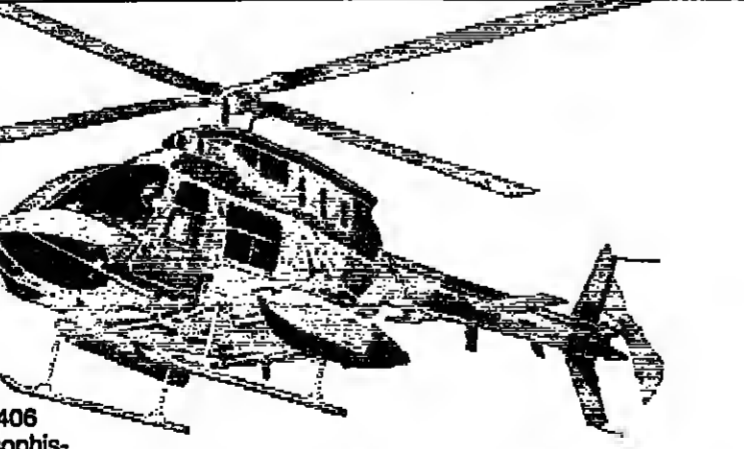
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VISIT BELL AT FARNBOROUGH BOOTHING M360 AND M371

MBB pauses for reflection

West Germany
RUPERT CORNWELL

THERE ARE two ways of looking at current developments in the West German aerospace industry. One view is that of Herr Hans Arnt Vogels, chief executive of Messerschmitt-Bölkow-Blohm (MBB), the country's largest aerospace manufacturer.

Herr Vogels talks of a phase of "consolidation" after the hectic expansion of recent years and before an expected new take-off in 1987. But others are less optimistic. They believe that "consolidation" might well be a euphemism for retrenchment and cutbacks.

Inconceivably, though, MBB must be retained. With almost 37,000 employees at the end of 1983, it accounts for around two-thirds of the total West German aerospace industry.

There is hardly a multinational programme in which MBB is not the German participant, and the fortunes of the company, with headquarters in the quiet town of Ottobrunn, near Munich, are a key barometer of the ever-sensitive politico-West Germany's ability to keep pace in high technology.

MBB is now in the midst of a far-reaching programme of diversification. In both 1983 and 1984, its traditional aircraft building business will account for only half of total sales, of DM 5.9bn last year and a shade less this year.

Indeed, the greatest growth is expected in the space sector, while the company is moving (or has already moved) into areas like factory automation and high-speed magnetic trains.

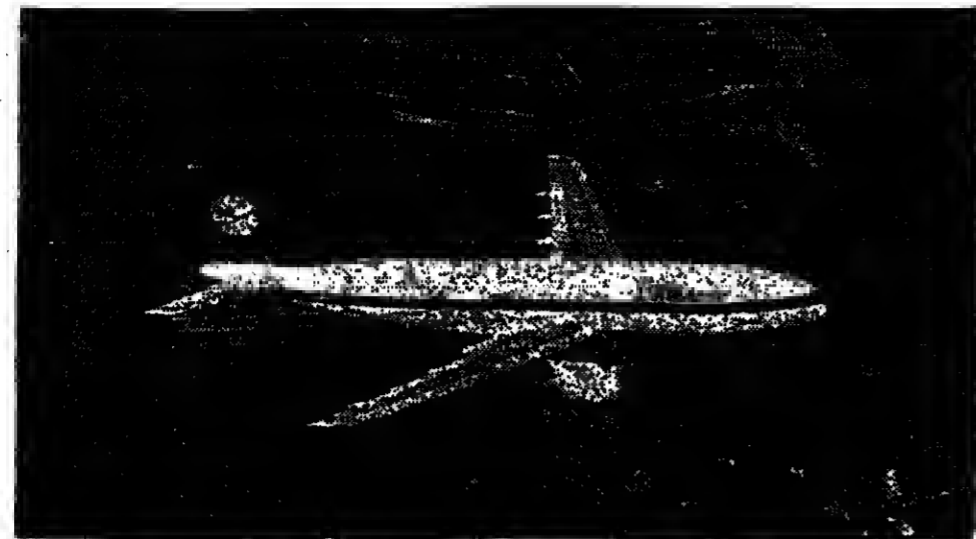
Swirling changes

The slowdown likely up to 1986, if seen in a historical perspective, is in some ways no more than a reasonable pause to catch breath after a decade of swirling change. Ten years ago MBB's turnover was only DM 1.5bn. Since 1974 it has doubled its workforce, quadrupled its sales, and also completed its merger with VFW, formerly the second West German aerospace concern.

At the same time, diversification has been matched by a basic commitment to collaboration abroad as the road to steady expansion. Joint ventures, of course, have been imposed by recent history on the military side of the West German aerospace industry, which covers about two-thirds of total business.

But Allied unwillingness to tolerate a fully independent German arms and defence industry has propelled West Germany to accept, perhaps more quickly than most, the inevitable: that major defence and civil programmes are now beyond the capacity of a single country.

The trouble is that both civil



West Germany is a major participant in the European Airbus Industrie venture, with Luftwaffe, the flag airline, a major buyer of both the large 225-seater A-300 and the smaller 220-seat A-310 Airbus above

and military aerospace projects are stagnating. Civil work has been hit by the recession in the air transport industry, now showing signs of coming to an end. Military work remains hampered by the permanent pressure on the national defence budget and the financial weakness of Third World nations, which has cut deeply into export markets.

Typical is the state of the European A300/310 Airbus programme, in which MBB has a 37.9 per cent stake. This year only 45 Airbuses will roll off the final assembly lines in Toulouse against 47 in 1983. Next year, MBB executives gloomily forecast the figure could drop to 35—and almost certainly cause lay-offs among German workers on the Airbus programme.

The Bonn Government's approval of public funds for the development of the smaller A-320 Airbus will not immediately soften the blow. The first A-320 delivery will not be until 1988, and so far orders for the new aircraft have been sluggish.

The key military project is the Tornado strike aircraft, which is being produced by MBB at the rate of 42 a year. But when deliveries to the air forces of the three participant countries (Britain, Italy and West Germany) have been completed, export orders will be required to continue production beyond 1988 or 1989.

The unions are mixed, however. Greece, once a hoped-for customer, has said no; but Saudi Arabia could buy up to 40 Tornados.

A similar cycle has already been experienced by Dornier, the smaller privately-owned aircraft manufacturer intermitently but inevitably rumoured to be on the point of being taken under the wing of MBB. In 1983 Dornier's sales fell 20 per cent to DM1.26bn as a result of the rundown in the Alpha Jet programme on which it had worked with Dassault of France.

This year, however, Dornier is looking for the rebound that ought to come MBB's way only in 1987. Part of the reason is the go-ahead for the A-320, for which the company is a subcontractor.

More importantly, Dornier is expecting space activities, and the success of its Do-228 feeder turboprop aircraft, at least to make up its losses on the military side. Dornier reckons that turnover will recover to DM 1.65bn in 1984 and plans to raise investment this year from DM 34.5m to DM 50m.

The reasons for Herr Vogels' long-term confidence at MBB are somewhat more grandiose. One is the A-320, but the company is set to be the German partner in the "J-90" (Eurofighter) advanced combat aircraft, ratified in Madrid last month by five participating European Governments.

Agreement signed

West Germany will have 250 of the 1,000-aircraft Eurofighter programme, the largest multinational defence venture since the Tornado.

Six weeks earlier, moreover, an agreement was signed in Bonn and Paris for the PAH-2 Franco-German military helicopter programme, making MBB with the French State-owned Aerospatiale. The project will carry on from the existing PAH-1 and BO-105 helicopter programmes.

In the short-term, however, the fastest growth at MBB will be on the space side. While sales of its defence division may shrink from DM 1.8bn in 1983, to DM 1.4bn in 1984, satellite and other space activities will more than double to some DM 800m, against DM 337m last year.

The real impetus came with the success of the Spacelab mission last November and vindication of the jewel of West Germany's space programme. It was handled mainly by MBB-Erne, the space division of MBB. Spacelab will be followed up by a retrievable carrier pro-

ject, called Eureka, whose first mission is scheduled for the end of 1987.

MBB-ERNO is also heading a joint German-Italian study group which is due to make a detailed proposal—code-named Columbus—for participation in the U.S. Manned Space Station programme, after feelers were put out in a recent tour of European capitals by Mr James Beggs, the head of NASA.

But the most spectacular diversification of MBB could come much more quickly, and much nearer home. Herr Vogels has this summer confirmed his company's interest in securing effective control of Krauss-Maffei, the arms and locomotive building subsidiary of the Friedrich Flick industrial group, of which Herr Vogels was, until last year, a top manager before moving to MBB.

Flick is known to be interested in selling Krauss-Maffei, which makes the celebrated Leopard tanks. But the transaction has caused some misgivings, both among MBB shareholders (who include Krupp, Thyssen and Siemens) and in the Bonn Defence Ministry, which is uneasy at having a single supplier at the other end of many procurement programmes.

But control of Krauss-Maffei would help MBB in its ambition of DM 1bn of new sales a year from the 1990s.

Many analysts believe that a compromise will be reached. MBB will get effective management of Krauss-Maffei but only through a consortium of new owners. These would embrace other West German defence concerns like the Diehl group of Nuremberg and IWKA of Karlsruhe.

Meanwhile, MBB is examining various joint venture possibilities in the U.S., Europe and Asia. The fields include electronics, computer software and data systems. In view of Herr Vogels' observation that the electronics component of a new weapons system can reach 75 per cent, the trend is hardly surprising.

THE SYSTEMS APPROACH.

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SAAB links with U.S.

Sweden
DAVID BROWN

THE AEROSPACE industry of Sweden now has its hands full with two major projects.

First, it is breaking into the regional airliner market with the new SF 340 twin turboprop, which SAAB-Scania is now marketing in a joint venture with Fairchild Industries of the U.S.

Second, it is trying to fend off threats to its next-generation military aircraft—the JAS 39—by increasing expensive dollar-denominated foreign contracting.

On the commercial side, the SF 340 35-seat airliner has started rolling off the production lines in Linköping and is being delivered to customers in the U.S. and Europe following a four-year development programme and an investment of SKr 1bn.

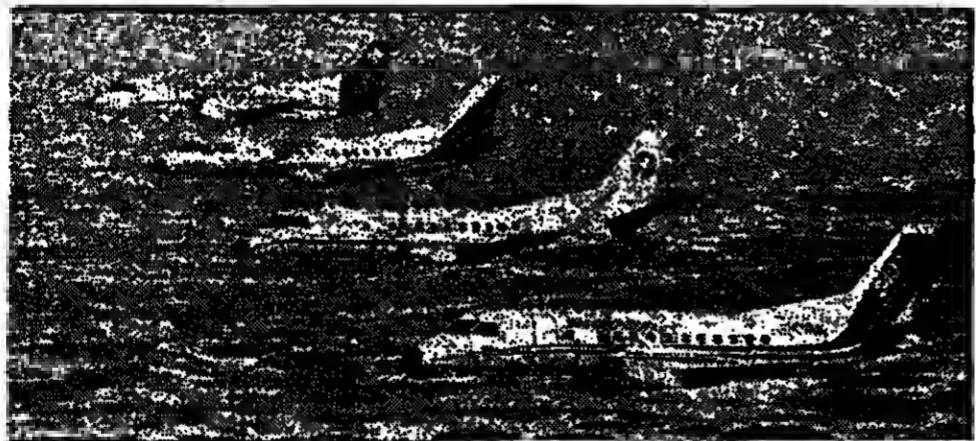
To cut its dependence on military procurement, SAAB plans to raise its civil aircraft turnover to half its total aviation business.

If the SF 340 project is to break even, officials estimate they will have to sell 200 aircraft, an estimated 10 per cent of the world market. About 130 aircraft are now on order.

It is competing with de Havilland Canada's Dash 8 and Embraer's Brasilia 120, among others. The basic model sells for \$5.2m.

The work has been divided so that Fairchild produces the wing assemblies, an interior, while SAAB is responsible for the fuselage and for final assembly in Sweden. The SF 340 is powered by General Electric CT7 engines. It has a range of 1,900 km and a speed of 500 km/hr.

On the military side, construction of the new JAS 39, designed as Sweden's next generation combat aircraft, is



SAAB-Fairchild, jointly established by SAAB-Scania of Sweden and Fairchild Industries of the U.S., is now in quantity production with the new SF 340 twin turbo-propeller regional and commuter airliner. Above are four of these 34-passenger aircraft

now the largest industrial project in the country.

It calls for delivery of some 140 aircraft, together with weaponry and equipment to a total value of SKr 32.7bn. A SKr 10bn contract has already been awarded by the Swedish Defence Materials Procurement Agency to a special industry group which includes SAAB, Volvo and Ericsson, among others, for an initial batch of 30 aircraft.

Under threat

But the project is being threatened by the high proportion of increasingly expensive dollar-denominated foreign contract, some 27 per cent of the total, and an estimated SKr 5bn shortfall between the allocation and actual cost has developed.

The defence ministry may consider deferring some aircraft purchases and cutting back on weapons systems rather than face a controversial reallocation of the country's already hard-pressed military budget. These options may not suffice,

however. "Whether we can make up the difference with these savings has now become questionable," a Defence Ministry official said recently.

The Swedish Government is quick to stress that a final decision can be avoided, at least for some months, until the aircraft reaches the production stages.

Among the major foreign subcontractors are General Electric (the F-404 engine), Lear Siegler (electrical flight systems) and British Aerospace, which best Rockwell to develop the all-composite wing.

SAAB-Scania is responsible for 60 per cent of the work including airframe construction and systems integration. Volvo is producing the single engine with General Electric and Ericsson Telecommunications Group is making the radar, sensor and target acquisition systems as well as the display.

Like its predecessors—the Viggen and Draken—the JAS 39 Gripen is designed for attack, intercept and reconnaissance duties, with minimal ground support. It will be able to land on very short airstrips or rural

roads and will not require specialist maintenance crews.

In space technology, the Swedish Riksdagen (Parliament) has allocated funds for a joint Nordic telecommunications satellite project designated Tele-K, with start-up costs of SKr 57m. Following a one-year experimental period ending in 1982, two satellites will take over much of the television, radio and data transmission services of the Nordic countries.

L. M. Ericsson is to produce advanced payload components, while SAAB-Scania will provide the platform guidance system as well as other computer and structural elements.

Meanwhile, a private venture has launched a competitive programme to market similar services in Scandinavia and Europe. Whether the new company—known as European Business Satellites—will win the channel allocations and advance contracts needed to launch the two 14-channel satellites for \$200m remains to be seen.

The Nordic postal and telecommunications services are responsible for the allocation decisions.

AIR CARGO

OCTOBER

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Export sales pick up as industry adapts

Israel

DAVID LENNON

THE first flight of a new type of executive jet, U.S. Congressional approval of funds for the Lavi (Young Lion) fighter project, and co-operation between the manufacturers of two competing "drones" have been the main developments in the Israeli aerospace industry in the past year.

The industry's export performance has also improved since the disappointments of 1982, when sales fell sharply. One of the keys to the partial recovery, according to executives in Tel Aviv, is the speed with which Israel adapted itself to the tougher export market.

The Westwind Astra business jet made its first flight in March, and deliveries are due to begin in October next year. It is manufactured by the local giant, Israel Aircraft Industries (IAI), which has sold more than 350 aircraft of the earlier Westwind 1100 series.

The latest in the line developed from the Jet Commander programme bought from Rockwell of the U.S. in 1982, the Astra has a range of 3,000 miles and a cruise speed of Mach 0.80. The company has already sold 10 Astras and received orders for another 15.

The decision by the U.S. Congress to overrule the Pentagon and allow Israel to use \$250m in military grants for research and development expenditures in Israel for the Lavi combat aircraft provided a major boost to the prestigious project, which some people felt was beyond Israel's financial capabilities.

This allocation made it possible for work to be pushed ahead on developing the Lavi despite the country's severe economic problems. It is believed within IAI that this has now guaranteed that the \$1.4bn project will be completed.

The prototype of the Mach 1.55 Lavi is due to fly early in 1986 and, following a Defence Ministry request to speed up the project, first deliveries of the 300 aircraft intended for the Israeli Air Force should begin in 1989.

Bet-Shemesh Engines, which is to produce parts for the U.S.

designed Pratt and Whitney PW-1120 engine for the Lavi, also received cheering financial news recently. This summer, 40 per cent of the Government-owned company's shares were sold to United Technologies of the U.S., which is Pratt and Whitney's parent company.

The sale price was reported to be more than \$10m. This may go some way towards easing its continuing financial woes, which are said to include an accumulated deficit of \$60m.

Bet-Shemesh Engines, founded in 1968, makes engines for the Fouga Magister training aircraft and for Tadiran's pilotless drone. It also makes components for the modified J-79 engines for the Phantom combat aircraft, while in the civilian field it produces industrial gas turbines.

The makers of the country's two competing mini-remotely Piloted Vehicles (RPV), IAI and Tadiran, have now formed a joint company to market their RPVs, thus ending the fierce competition between the IAI's Scout, made by the Israeli Army and Air Force, and Tadiran's Mastif, used by the army.

Over the next few years they

intend to develop one system to replace the existing two, either by making a hybrid or producing an entirely new vehicle. The agreement was made possible following a decision by the Defence Forces on what kind of RPV was needed.

Cameras

RPVs are used mainly for battlefield reconnaissance. They may be equipped with TV, telephoto and panoramic cameras linked to ground control stations. The Scout, which can carry a payload of 38 kg, has to be launched from a truck-mounted ramp, while the 30 kg payload Mastif can also take off under its own power from a runway or a road. Both have a flight endurance of seven hours and an operating range of 100 km.

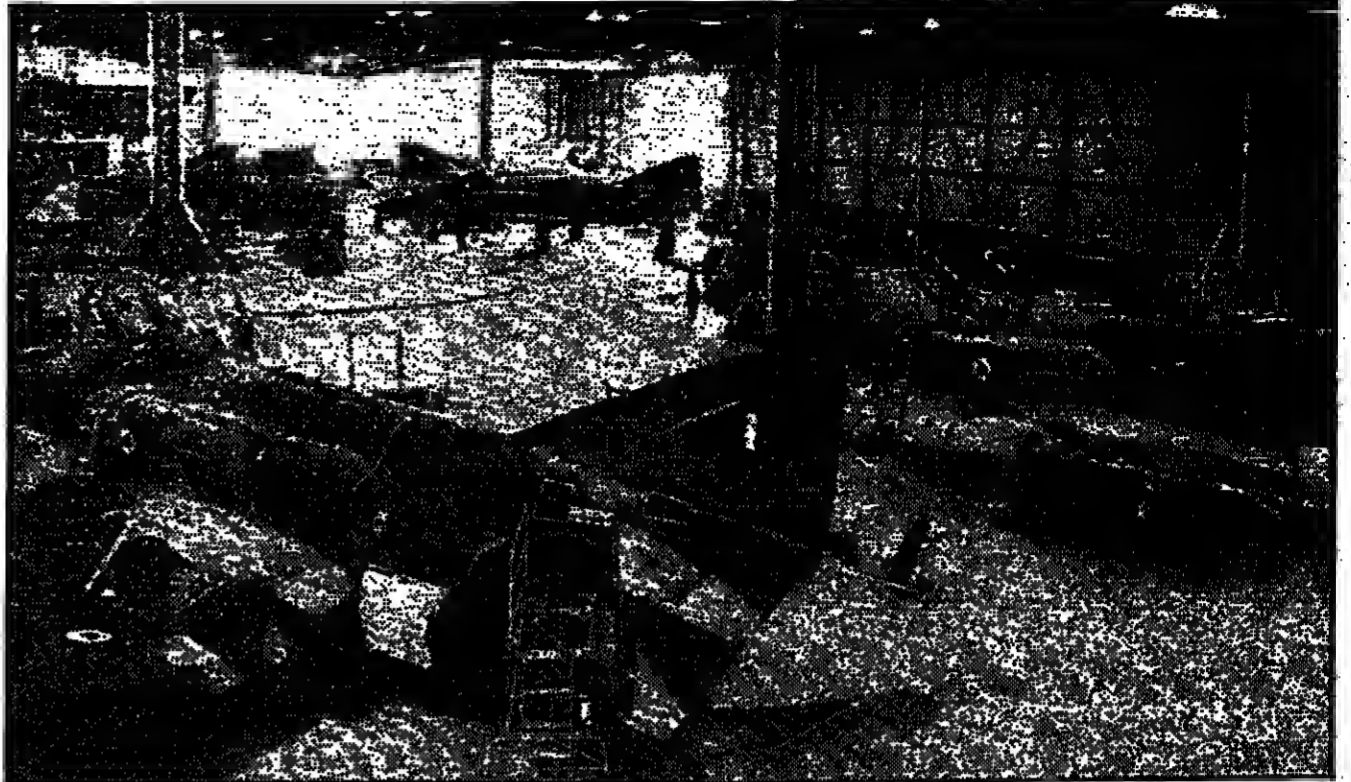
Hundreds of Israeli companies will work as sub-contractors on the Lavi project. Typical of these is Iscar Blades, which won the substantial contract to supply turbine blades for the Lavi engine. Iscar exports 90 per cent of the 500,000 blades it produces each year.

Given Israel's success in carrying out projects which would appear beyond its capacity and resources, it would be unwise to ignore another recent development, however quixotic it may appear at present.

Israel has established a Space Agency and begun a modest space programme. The most ambitious project is a space satellite which is the subject of an agreement between the local Amit Industries and Fairchild of the U.S.

In the first stage the Israel Space Agency is engaging in information exchange with NASA of the U.S. about the use of the Space Shuttle. The five-year plan calls for building a low-earth orbit platform to carry out several experiments. A more ambitious goal, 10 years hence, envisages a communications satellite and possibly a meteorological satellite.

The plans also include locally-designed and built satellites which could be launched from Israel using either a locally-designed launcher or one purchased abroad.



Hellenic Aerospace Industry (HAI) is capable of performing extensive maintenance on many different aircraft types, including these F-4E Phantom jet fighters

A high-technology vision

Greece

SINCE 1979, when Hellenic Aerospace Industry (HAI) began operation with managerial and technological help from Lockheed International and other overseas companies, it has been saving millions of dollars in vital foreign exchange by handling all repair and maintenance for the Hellenic Air Force, and to some extent Olympic Airways, the national carrier.

HAI's \$400m "state of the art" facility at Tanagra, north of Athens, is Greece's single largest industrial investment, and the jewel in the crown of the national arms industry. The Socialist Government is looking to HAI to fulfil its visions of a high-technology industry in Greece.

The company also overhauls, repairs and maintains various types of aircraft from a number of foreign countries through contracts won against tough international competition. HAI has been particularly successful

in the Middle East. HAI officials say, to Greece's cross political ties with the Arab world.

Contracts are reported to include Egyptian C-130 "Eucalypt" transport aircraft, with agreements reached more recently for the same type of aircraft with Jordan and Canada (Canadair). A contract with Nigeria is said to be imminent.

A U.S. Air Force in Europe contract for J-79 engines was recently renewed for two years, according to HAI officials. The company manufactures door frames for Airbus Industrie and does paint work on Aeritalia's G-222 aircraft. Electronics work includes the repair of Sidewinder missiles for Nato and the Hellenic Air Force.

Spin-off

But HAI is proudest of two recent deals with French companies, again seen as a spin-off of the Papandreu and Mitsotakis governments' close ties. The one, with Snecma, has made HAI an official overhaul and maintenance centre for ATAR engines for the Middle East and other countries.

The second, with Dassault, gives HAI overhaul and maintenance rights for Mirage F-1 engines.

But now, according to its managing director, Mr Panagiotis Fotilas, HAI is poised on the brink of a new era. It hopes to make the leap into aircraft assembly, and, in the long-term future, into full production.

These plans are being made with an anxious eye across the Aegean, where Greece's arch-rival Turkey is preparing to move into F-16 Phantom assembly after a recently clinched deal with General Dynamics.

"In two years they will have a super-HAI set up. We have to

move to stay ahead," Mr Fotilas said.

As with Turkey, the decisive development is expected to be the long-planned purchase of about 100 new fighters by the Greek Government to update the rag-bag of mostly older aircraft which make up Greece's present air power.

To offset the purchase—more than \$20n—which has been dubbed the "buy of the century" and will be the largest single arms purchase in the history of the Greek armed forces, companies have been invited to offer the transfer of valuable technological know-how to HAI.

In this way the company hopes to participate not only in repair and maintenance but also in parts manufacture and the assembly of aircraft.

The Government recently announced that it has narrowed down its choice to the U.S.-made F-16 and F-18 jets and the French Mirage 2000. A mixed Franco-American package is thought likely.

But the British-West German-Italian Tornado has been struck off the shortlist—strictly, Mr Fotilas hastens to add, for reasons connected with the operational needs of the Greek Air Force.

"It was a purely Government decision, taking the Air Force's requirements into account," the HAI director said.

For HAI a Tornado purchase would have meant full partnership with Panavia, the manufacturing company, and through that a possible "in" on the planned new European aircraft. The Prime Minister, Mr Andreas Papandreu, recently stressed that Greece was not yet economically or technologically ready to contemplate such an involvement.

For the past two years HAI has been the theatre of substantial internal changes—

mainly the early termination of the 1976 contract with Lockheed International which provides the technological and managerial know-how it requires.

Mr Fotilas vehemently denies reports from within the company of slacking productivity and increasing workers' demands with HAI now a fully state-run company.

"Where there are fair demands by employees these will be met. But we are on the strictest orders from the Prime Minister himself to run HAI according to impeccably private-enterprise criteria," said Mr Fotilas.

Advantage

A big advantage in ending the contract early, in the Greek view, is the saving of an estimated \$300m a year in Lockheed salaries. Although HAI officials are proud that the company's Drs 1.87n losses for 1982 were trimmed down to about Drs 1bn they are still worried about its total long-term and short-term foreign debt of about Drs 23bn.

Hitherto, HAI officials expressed their impatience with what they considered a sluggish rate of technology from the U.S. They also felt that the supervision of marketing by Lockheed created a conflict of interests, since HAI competed with Lockheed subsidiaries for some contracts.

In the tussle to disengage, Lockheed and HAI are involved in mutual lawsuits of a total value of about Drs 550m, but HAI officials insist that relations are good and do not exclude future co-operation, using Lockheed advisers on an ad hoc basis.

"We may have our differences with Lockheed but that doesn't mean that our relations are poor," Mr Fotilas said.



The Kfir (Lion Cub) fighter, shown above, built by Israel Aircraft Industries, has already achieved considerable success with the Israeli Air Force. A new and improved combat aircraft, the Lavi (Young Lion) is now under development

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Expanding symbol of modern development

HIGH ABOVE the West Java plain lies the city of Bandung, the home of the centrepiece of Indonesian industry and symbol of its modern development. P. T. Nurtanio National Aerospace.

Indonesians are rightly proud of Nurtanio's growth and development, when it started only eight years ago it had a work-force of less than 2,000. Now it employs more than 11,000 and runs extensive training programmes on all aspects of aerospace design and manufacture.

Nurtanio is the brainchild of Professor Jusuf Habibie, who in the mid-1970s gave up his job as an executive vice-president of Messersmitt-Bölkow-Blöhm in West Germany to return to Indonesia and found a national aircraft industry.

In its early stages Nurtanio concentrated on the production of the CN-212 Aviocar built under licence from Construcciones Aeronauticas SA (CASA), of Spain.

More than 60 of these 19-28-seater twin-engine turbo-prop aircraft are now in operation, mainly with domestic users, though there have been foreign buyers, including the Thai armed forces and Air Guam.

Nurtanio says a further 70 CN-212s have been ordered. It has also entered into a number of agreements to produce helicopters under licence. Under an agreement with Aerospatiale of France it produces the Puma NSA-330 and the Super Puma NSA-332 helicopters.

There are agreements with Bell Textron of the U.S. and MBB-Kawasaki to make the Bell-412 and BK-117 helicopters under licence. Last April Nurtanio entered into a further agreement with MBB to produce its 109 helicopter. It already produces the MBB 105 helicopter.

While joint ventures have tended to be dominated by the West German and Spanish agreements, Nurtanio has various technical agreements with

other companies including Boeing and British Aerospace. For more than two years BAE has collaborated with Nurtanio on a missile development programme centred at the company's armaments headquarters at Jakarta in central Java.

British Aerospace has also been collaborating with the Indonesian Air Force over the past nine years and has sold 20 Hawk trainer jets.

Professor Habibie says Nurtanio is keen to move into the military field, but at present it is concentrating on the production of its 40-seater twin-engine turbo-prop CN-235, a multi-purpose machine designed specifically to meet the needs of developing countries.

The CN-235, developed and manufactured jointly by Nurtanio and CASA, is proudly referred to as Indonesia's own aircraft. It underwent its first test flight at the end of last year and is due to enter service next year.

Nurtanio says that more than 50 per cent of the aircraft is made in Indonesia and that it has received more than 100 orders so far, though this figure has been questioned by some in the aircraft industry.

Professor Habibie claims that the General Electric-powered CN-234 will be the cheapest aircraft of its type on the world market, comparing its price—\$118,000 per passenger—with the \$160,000 per passenger of similar aircraft built in Brazil.

Plans include the manufacture of a bigger version of the CN-235, the CN-260, which would be capable of carrying 60 passengers. Long-term plans are for the manufacture of a 110-seater airliner.

Professor Habibie has also hinted that Nurtanio would be willing to assemble the European Airbus for Indonesia's flag carrier, Garuda. British Aerospace has also expressed its willingness to come to an agreement with Nurtanio for the manufacture of components or even Indonesian assembly of the new BAe 146 four-engine jet airliner.

But Nurtanio is not without its critics, some of them very senior people in Government. Many have questioned the wisdom of putting millions of dollars into capital-intensive projects like Nurtanio in a developing country where the average per capita income is still below \$600 a year.

Professor Habibie, regarded by some as the supreme of Indonesian technological development and by others as a free-spending and too ambitious technocrat, has so far had the full support of President Suharto.

He has also been able to take advantage of the large domestic demand for transport in Indonesia, a country of more than 14,000 islands spread across a tenuous coast, coast to coast, than the U.S.

Local customers, according to Indonesian trade legislation, can buy foreign aircraft only if Nurtanio cannot supply them, while some operators have criticised the CN-212 for its high operating costs.

Production of the CN-235, meanwhile, is behind schedule and engineers working on it say there are still a number of technical problems to be solved.

But that Nurtanio and CN-235 have a bright future and he wants Indonesia to be the main driving force behind South East Asia's aviation industry in the years ahead.

"By the time I retire," says the professor, who is only 47, "I want to see 60,000 workers at Nurtanio, making aircraft in no way inferior to those of other countries."

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WOR

AEROSPACE 19



Embraer's Tucano light training aircraft (above) is another contender for the RAF's big basic trainer aircraft contest. If selected, the Tucano would be built in the UK by Short Brothers of Belfast. Embraer has also built up a big business in the manufacture of small airliners. The latest in the line (right) is the EMB-120 Brasília, a 30-passenger twin turbo-prop airliner, now under development.

Embraer steps up sales drive

Brazil

ANDREW WHITLEY

"THE BIGGER WE ARE, the bigger the fall," Col. Orestes Silva, President of Embraer, said recently. "We decided to leave the big losses to the big manufacturers," he added.

Despite this laudable caution about the dangers of over-rapid growth, Embraer, the Brazilian state-controlled aircraft maker, is preparing for a high-speed take-off over the next few years. As three new models—two of them wholly Brazilian-designed—come into commercial production, sales are forecast to double over this year's estimated \$170m to \$180m. Embraer says this will put it above Piper in the world manufacturers' league table. Piper is its long-standing partner for light aircraft.

Embraer also claims that it will put it on the same level as Cessna and Beechcraft, the other leading U.S. manufacturers of light aircraft. As the leading force in the young Brazilian aviation and aerospace industry, Embraer celebrated its fifteenth anniversary this month and is now preparing its new 30-seater turbo-prop commuter aircraft, named the Brasília, for the Farnborough Air Show and a European demonstration tour.

At Farnborough the Brazilians will be making their biggest sales drive so far. Apart from the Brasília, they will be showing the Tucano, their successful basic trainer/ground attack aircraft, and a mock-up of the AMX, a subsonic jet fighter being developed in conjunction with Aeritalia and Aer-Macchi of Italy.

An accident to the first prototype of the AMX last May dashed the company's hopes of showing the new aircraft itself at the show, as had been planned. It also set back the \$600m programme—in which Brazil has a 30 per cent interest—by several months.

Despite the latest delay in the joint project, both sides are pressing ahead with a programme which Sr Odilio Silva, Embraer's commercial director, says could remain in production for 20 years. A formal decision by the Brazilian and Italian Governments to sanction the tooling-up necessary for full-scale production is expected soon.

In Sr Odilio's opinion the purely civilian aircraft maker "will soon be dead." But the Brazilian company is anxious to maintain its strategy of avoiding dependence on any one type of aircraft, whether military or civilian, or indeed on any one market.

This year, when half its revenue will be derived from exports, is considered exceptional. The traditional ratio for Embraer has been 80 per cent home sales and 40 per cent foreign; and the basic rule of thumb is regarded as one-third military, one-third civilian and one-third exports, of either type.

A recovery in the currently depressed Brazilian market is thus considered a must for balanced development. Studies conducted by the company indicate a potential market of 20,000 small aircraft in Brazil, four times as many as are now in service, and foreign competition is firmly excluded by trade barriers.

Sr Odilio already detects the first signs of a domestic recovery. But even so he expects this year to be one of the most difficult the Brazilian company has faced in terms of sales.

In terms of profits, he says, Embraer is likely to end up marginally in the black, based on "previous years' experience of an end-year rush in sales. Only twice in its history—in the first year and in 1981—has Embraer, which is financed by private capital, shown a loss.

In 1983, with the first deliveries of the Brasília and the start-up of a large order from Egypt for the Tucano, the company says it will see "an important recovery." How it then builds on that recovery will depend heavily on how many of the airline operators who have taken out options on the Brasília turn them into confirmed orders.

So far, out of the 119 options on the Brasília aircraft only 27 have been confirmed—from three U.S. regional carriers.

Meanwhile, before the end of the year Embraer and Short Brothers of Belfast hope the Royal Air Force will have selected the Tucano as its new basic trainer. Four competitors have been shortlisted for the \$770m order for 155 aircraft. As the trainer will be manufactured under licence in Northern Ireland, all Embraer will get out of the deal will be royalty fees and the RAF's "seal of approval." "But it will

be a good visiting card," says Sr Odilio.

The Brazilian and UK companies recently signed a broad-ranging collaboration agreement to work on other possible joint ventures. These are to be discussed by a joint planning committee after the Farnborough Air Show.

Significantly for a company whose impetus grew out of the Brazilian military's anxiety for a nationally-owned manufacturer, Embraer is firmly opposed to a strategy of self-subsistence.

Two-way street

"We must not aim at self-sufficiency, because international commerce is a two-way street," its president recently told a leading Brazilian newspaper. Indeed, the company is heavily dependent on imports in certain key areas such as avionics and communications.

Imports of equipment from Western manufacturers average between \$50m and \$65m a year, two-thirds of typical export earnings. Over one-third of the value of the Brasília is imported.

A long-standing relationship has been built up with Pratt and Whitney of Canada, for example, for successive variants of its PT6A and PW115 turbo-prop engines. These, Embraer says, are the best for its type of aircraft.

Another secret of success, the company says, is the development of a family of models, mostly with military applications, of the basic aircraft. The Bandeirante, Brazil's first home-made aircraft and a great success around the world

Satellite technology brings benefits

Japan

JUREK MARTIN

JAPAN is pushing ahead with an ambitious space programme aimed at establishing its own technology and production facilities for satellite construction and launching.

Last month the Government's Space Development Council finalised details of a new Y200bn rocket programme, the "H-2." According to the government's planning, the H-2 will be ready for launching in 1991-1992 and capable of lifting a 2,000 kg satellite into geostationary orbit.

The H-2 will be Japan's most powerful rocket by a substantial margin. The standard satellite launch-vehicle currently used by Japan's National Space Development Agency (NASDA), the H-1 has a maximum satellite payload of 350 kg.

Its immediate successor, the H-1 rocket, is now under development for planned launches beginning in 1988 and will be capable of carrying a 550 kg satellite into geostationary orbit.

Aerotec recently entered into a tentative joint production agreement with Sial Marchetti, a subsidiary of Agusta of Italy, to build two small military aircraft. But the refusal of the financially hard-pressed Brazilian Air Force to place the necessary minimum order has shelved the project.

A similar fate may also befall the plans of Sikorsky of the U.S. to make helicopters in Brazil, probably in association with Embraer. The Brazilian Air Force currently needs a new helicopter, but the resources to finance its construction are apparently not available at present.

The only existing helicopter manufacturer in Brazil, Helibras, is a joint venture between Aerospacia of France and the Minas Gerais State Government. Its small factory makes the Esquilo light helicopter, but despite the potential demand in Brazil it has not been a great success around the world.

A significant aspect of Japan's planned emancipation from U.S. technology is that it could then cease to consider itself restricted by U.S. views in respect of launching satellites for third countries or exporting satellite technology and equipment.

Japan's wish to develop its own satellite technology is causing some grumbles among trading partners who see aerospace as one of their few opportunities to redress their otherwise large bilateral trade deficits with Japan.

The European satellite consortium, Ariane/Aerospacia, secured the help of no less than four ambassadors last month to lobby the Japanese Government into buying a weather satellite built by Aerospacia of France and launched by Ariane.

The European consortium wanted to fill a "slot" in Japan's satellite programme for a 1988 launch. It argued that it could supply and launch the satellite for about ¥14bn, compared with what it claimed would be a ¥20-21bn bill for Japan's own planned launching of a satellite built by Hughes Aircraft of the U.S. under prime contractorship of Nec Corporation and launched by Japan's own H-1 rocket.

European diplomats also said they wished the satellite proposal to be regarded as a "test-case" of Japanese Government willingness to buy cost-competitive major capital goods from foreign suppliers.

Neither the price nor the politics of the European proposal won over Japan's Foreign Ministry, which told the lobbying Ambassadors that satellites were an area in which Japan wished to substitute its own capability for foreign dependence.

A Science and Technology Agency official recently said that Japan's desire to be independent of foreign satellites was motivated by more than strategic considerations. He added that Japan was dissatisfied with the poor record of foreign satellite technology and believed it could make more reliable equipment itself.

One piece of foreign technology that does what the Japanese appetite, however, is the proposed U.S. permanently orbiting space station. Mr Yasuhiro Nakasone, Japanese Prime Minister, is said to be enthusiastic about Japanese participation in the project.

Japan expressed positive interest in, but not a formal commitment towards, investing in the space station, when Mr James Buggs, chief of the U.S. National Aeronautics and Space Administration, visited Tokyo last March.

If Japan does take a slice of the project, its investment could be as much as ¥300bn. Further indications of Japanese intentions are expected later this year.

Measowhile, Japan's civil aviation industry has recently taken what may prove to be a crucial Government-guided first step towards becoming a major force in world aircraft manufacture. Japan Aircraft Development Corporation, a joint venture of Mitsubishi Heavy Industries, Kawasaki Heavy Industries, and Fuji Heavy Industries, agreed to partner Boeing of the U.S. in the development of a new generation of smaller and more fuel-efficient commercial airliners.

Japan Aircraft Development (JAD) already co-operates with Boeing in the production of the B767 airliner, to which it subscribed 15 per cent of development costs and for which it supplies 15 per cent of the parts. The Japanese consortium had no project management role, however.

JAD is committed to a 25 per cent stake in whatever emerges from the new partnership with Boeing and will be actively involved in planning and marketing. The partnership will not necessarily result in a major manufacturing project, however. It is starting off at the feasibility study stage.

But it enjoys the high expectations of its Japanese investors and of the Ministry of International Trade and Industry, which helped to study possible options before advising JAD that the Boeing deal was its most hopeful prospect.

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We enhanced the time-tested Pratt & Whitney JT15D

Specifications	Original Citation II	New Citation S/II
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Range (8 passengers, maximum cruise speed)	1,725 miles (1,500 nm)	1,955 miles (1,700 nm)
Range (6 passengers, maximum cruise speed)	1,907 miles (1,658 nm)	2,070 miles (1,800 nm)
Baggage Capacity	1,150 lb., 65 cu. ft.	1,450 lb., 79 cu. ft.
Maximum Ramp Weight	13,500 lbs.	14,900 lbs.

ironically, fall woefully short of the Citation S/II in cabin size, comfort, and baggage capacity. The Citation S/II is a true eight-passenger cabin in every sense of the term. All eight of its passengers enjoy ample cabin space. Each sits in a wide, luxurious seat that not only reclines, but tracks fore, aft, and laterally.

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Tucano: Jet-like training at turboprop costs.



The EMB-312 Tucano has been designed from the outset to simulate a jet, although retaining turboprop low purchase and operating costs.

The jet atmosphere starts in the cockpit: excellent visibility for both student and instructor, thanks to the single-piece canopy and staggered-tandem seating, Martin Baker ejection seats, air conditioning, full blind-flying instrumentation and NAV/COMM equipment.

But jet-like handling is the Tucano's strongest feature: the airframe is an all-new design married to the 750

SHP PT6A-25C turbine to render jet-like characteristics. A single-lever controls both engine power and propeller pitch, acceleration at take-off is brisk and initial rate of climb exceeds 3000 ft/min, while level cruise speed reaches up to 250Kt. Precise and crisp controls in a +6G and -3G airframe enable very sharp hesitation rolls and simulate the powered controls of an operational jet. The Tucano covers a wide training syllabus, from primary through basic, up to advanced and weapons delivery stages, and can carry up to 2200 lb. (1000 Kg.) of ordnance at four

underwing hard points. These are some of the features that prompted the Royal Air Force to place the Tucano on the short list of 4 contenders for the replacement of the Jet Provosts.

For further information: CSE Aviation Ltd. - tel. (86-75) 4321, telex: 83204 - Oxford - England or Embraer (Brazil) - tel. (123) 22-7070, telex: (391) 1133589.

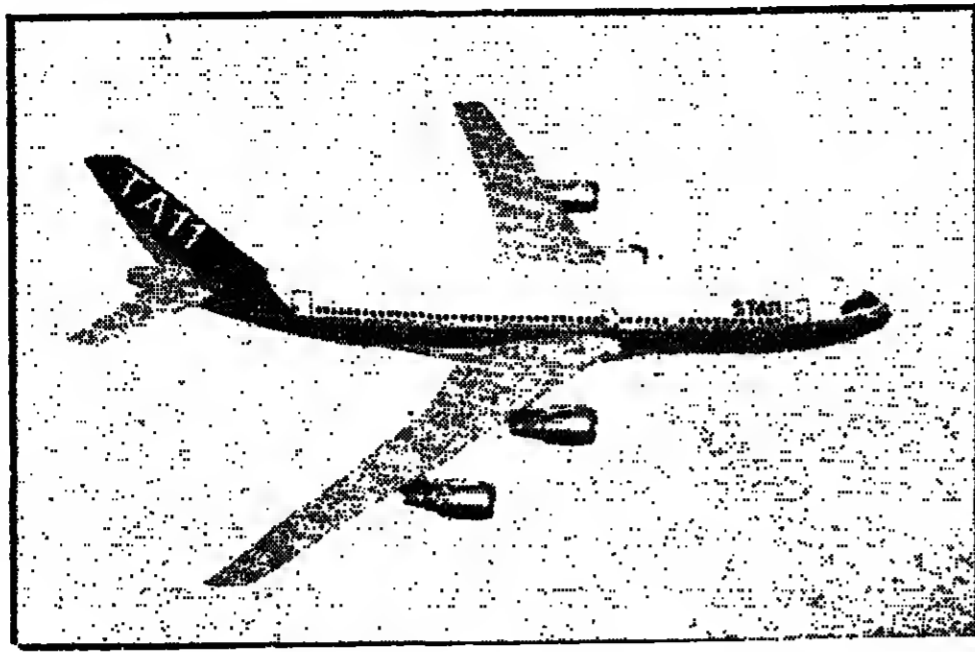
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AEROSPACE 20

Seeking an export business



The European Airbus Industrie TA-11 four-engined airliner project is aimed at providing an aircraft capable of flying long distances with smaller payloads than those carried by the bigger 747 Jumbo jet. As such, it could be used on routes to such countries as Australia, South America and in the Far East, where long range is required but where traffic densities may be low.

Seeking to extend skills

Australia

ALTHOUGH the Australian aircraft industry is relatively small, it is well skilled in modern aerospace techniques. This knowledge has been derived not so much from the limited production of indigenously designed aircraft but more from the extensive experience in sub-contract component manufacture, overhaul and other support work for a wide variety of foreign-designed civil and military types.

The Australian industry's policy is now to expand wherever it can. The aim is to increase its skills in design, development and manufacture so as to win a share of the substantial workloads likely to occur in the manufacture of components for the new generation of civil airliners now planned in Europe and the U.S.

The Commonwealth Aircraft Corporation, of Port Melbourne, Victoria, currently a primary supplier of equipment and services to the RAAF,

The Government Aircraft Factories, of Fishermen's Bend, Victoria, responsible for the Nomad light transport aircraft, and manufacture of parts for overseas civil aircraft such as the F-28 Fellowship and also for military aircraft used by the RAAF.

Hawker de Havilland Australia, of Bankstown, New South Wales, primarily involved in the provision of sub-contract manufacture, overhaul, modification and repair services to the Australian Defence forces and overseas countries.

Hitherto the industry has been involved primarily in sub-contract and support operations and has had only a limited aircraft production capacity. The Nomad light transport and utility aircraft, in various civil and military versions, has been one of the major products in recent years.

Canada PT6A turbo-prop, is due to be rolled out later this year and to fly early next year, with first deliveries to the RAAF in 1987.

After launching the A-10, the Australian Aircraft Consortium submitted to the RAF in Britain its ideas for a new version, the A-30 Wamira II, as an entry for the RAF's own basic trainer competition to find a successor to the ageing Jet Provost.

Earlier this summer a new joint company, AAC Westland, was set up in the UK with a view to exploiting these ideas as well as being responsible for Wamira II production if that aircraft is selected for the RAF. Besides these activities the Australian industry is interested in participating in other important new international civil aircraft developments, including a small stake in the A-320 Airbus. An agreement on A-320 work was recently signed with British Aerospace. The industry is also being wooed by the U.S. with a view to participation in future civil aircraft manufacturing programmes.

Also envisaged is the Westland 30 as having a major role in Australian military and civil activities as well as being marketed throughout the Far East.

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India

INDIA is exhibiting aircraft at Farnborough for the first time in 12 years. Two trainers, including the HTT 32 turbo-prop, which made its maiden flight last month, will demonstrate the country's determination to prove internationally that it can design, develop and make its own aircraft.

This capability is about to be tested to a greater degree than ever before on a new light combat aircraft project to be started soon for the 1990s, probably in collaboration with Western European companies.

The exhibits, staged by India's public sector manufacturer, Hindustan Aeronautics (HAL), will be more for prestige than sales. India is not in the export business yet, although last year it won its first significant order. It sold eight of its Chetak helicopters (the French Alouette III made under licence) to the Soviet Union and is hoping to sell more.

The Indian aerospace industry is estimated to employ about 75,000 people, producing a range of aircraft and avionics as well as equipment for the country's own space programme.

HAL employs 40,000 at eight locations and is the major organisation involved. Founded in 1940, it built its first aircraft — a Harlow trainer — a year later. But it was handed over to the U.S. Air Force in 1942 as an overhaul base and did not resume making aircraft until after the war.

By last year it had built about 840 of indigenous design and 1,580 of foreign design, with sales — almost all to the Indian Air Force — totalling Rs20bn (about £1.3bn). The annual value of production rose from Rs 980m in 1973-74 to Rs 3bn in 1982-83.

As a developing country conscious of its role as a major power in the Indian Ocean region, India wants to prove its ability to design and produce defence equipment.

But other pressures get in the way of this ambition. In particular it is determined to equip itself as fast as possible with modern weapons, especially now that the U.S. is strengthening



Final assembly of a Jaguar jet strike aircraft of the Indian Air Force at the Bangalore plant of Hindustan Aeronautics, HAL, undertaken by licence production in India of the European (Sopwith) designed Jaguar.

ing Pakistan's defence capacity with F16 fighters and other equipment.

HAL also suffers from the Indian public sector's often stifling bureaucratic inefficiencies and it cannot design or construct aircraft fast enough to meet the country defence requirements.

There is also always the counter-attraction of buying "off-the-peg" from the Soviet Union on very cheap terms. The Soviets have opposed India's defence purchases from Western Europe in recent years.

India is now believed to be finishing the purchase of Soviet Mig 29 fighters and has its eyes on the Mig 31. It has been making Mig 21s since 1963 and in the "Bis" version since 1976.

The Ministry of Defence — which stoutly denies that HAL is inefficient or has production problems — says that more than 2,500 items out of a total of 2,893 have been Indianised on the Mig 21s.

Now it has finalised arrangements with the Soviets to start assembling the Mig 27 airframes at its Nasik plant, north-east of Bombay, and engines at Koraput, in the eastern state of Orissa.

Meanwhile, its Jaguar output

is slowly building up. Four aircraft were produced at HAL's main factory in Bangalore last year and nine are planned for 1984-85.

The deal with the UK, after various amendments, now provides for the delivery of 40 aircraft made in Britain and the assembly, with progressive indigenisation, of a further 76 in India.

By 1987-88 it is planned to produce the final 31 Jaguars with almost every component made in India.

With these Russian and British fighters made in India, the Government decided in June not to go ahead with an option to manufacture the French Mirage 2000, having already purchased 40.

India has recently completed arrangements to make the Dornier 228 light transport aircraft under licence from West Germany for the air force, coast guard, navy and the provincial airline Vayudoot. Initially 100 are to be made.

Having produced 400 French Chetak and Chetaks under licence since 1974, HAL is now preparing to design and manufacture a light helicopter with MBB of West Germany. It will

be labelled "Indian" although development work will be done in both countries with exchanges of staff.

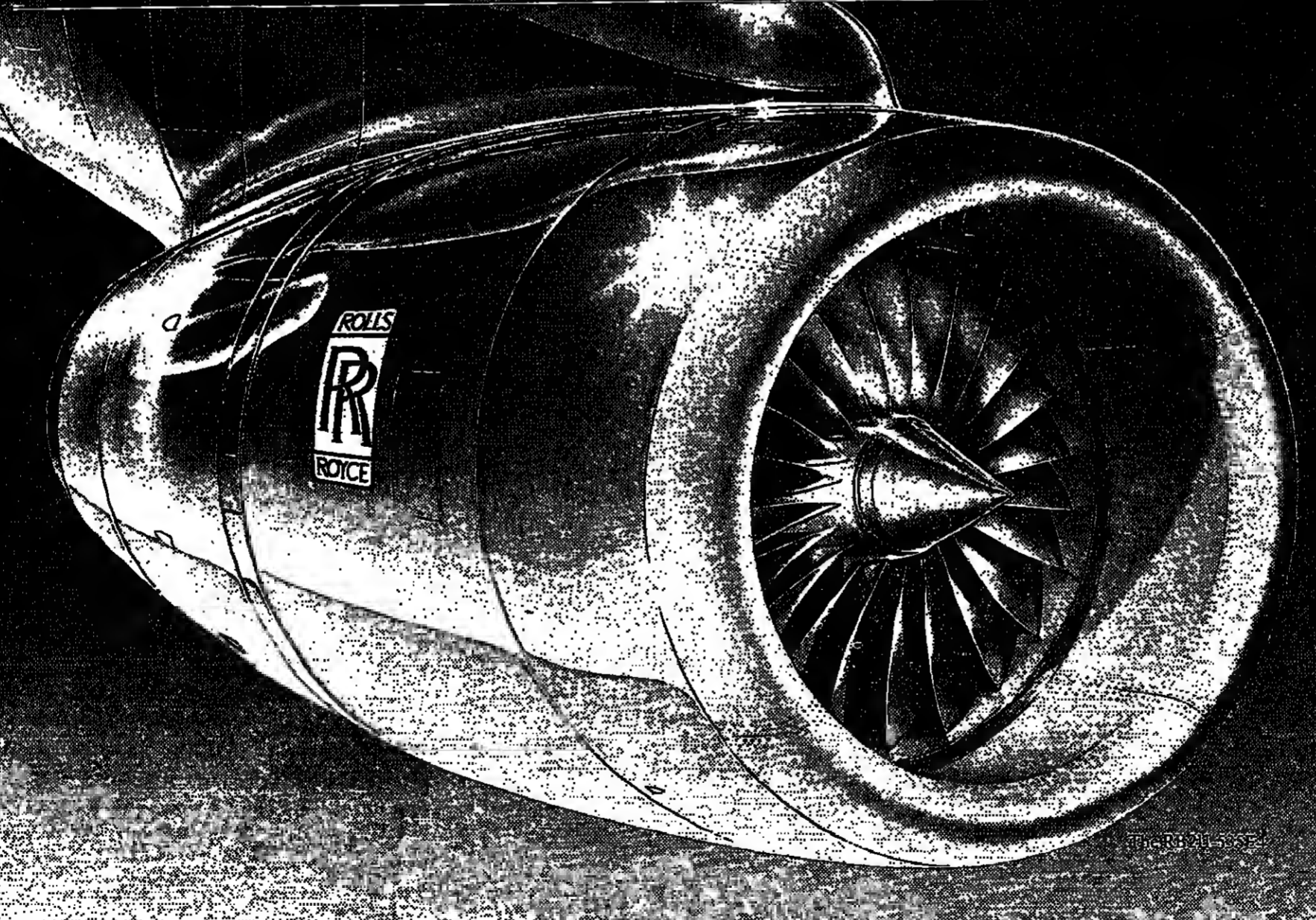
But the most ambitious project is the light combat aircraft on which the Indian Government is combining all its various research and production facilities, including universities, for the first time. It wants an aircraft to fly as a prototype in the early 1990s and to last for 20 to 25 years.

The Defence Ministry intends that HAL will collaborate with foreign companies for key parts of the development and now studying proposals from British Aerospace, Dassault of France, and MBB and Dornier of West Germany.

It will probably choose to collaborate next year on specific items from more than one of these companies. It is also receiving blandishments from the Soviet Union which would prefer that India did not link up with Western Europe on such a prestige project.

If both projects are kept on schedule, the light combat aircraft will be made in the Bangalore factory now used for the Jaguar work. This will be running down about 1990, just as the new project is expected to begin taking shape.

THE ECONOMIST



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